Logic Analyzers
PM3551/10/30/50/70

Operating manual

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821202

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L O G I C A N A L Y Z E R S

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Dezember 2, 1982

OPERATING MANUAL

TABLE OF CONTENTS

Section	Description	Page
1	INTRODUCTION	1.3
1.1	General information	1.3
1.2	Features	1.4
2	CHARACTERISTICS	2.1
2.1	Logic state analyzer	2.3
2.2	Logic timing analyzer	2.7
2.3	Operation	2.9
2.4	Display	2.9
2.5	Display modes	2.10
2.6	Compare mode	2.11
2.7	Power supply	2.11
2.8	Environmental characteristics	2.12
2.9	Physical characteristics	2.14
2.10	Accessories and options	2.15
3	GENERAL DIRECTIONS	3.1
3.1	Information and warnings for the User	3.1
3.2	Description of controls, connectors and display	3.5
3.2.1	Front panel	3.5
3.2.2	Rear panel	3.8
3.2.3	Left side panel	3.9
4	DESCRIPTION OF THE MENUS	4.1
4.1	Full menus	4.
4.1.1	Configuration menu	4.
4.1.2	Trigger menu	4.
4.1.3	Data menu	4.
4.1.4	Compare menu	4.
4.1.5	Options menu	4.
4.2	Condensed menus	4.
5	DESCRIPTION OF THE DATA DISPLAYS	5.1
5.1	List	5.
5.3	Timing	5.
6	CONNECTION	6.1
7	USER MESSAGE LIST	7.1
8	OPERATION	8.1
8.1	General	8.
8.2	Triggering	8.
8.3	Selective data acquisition	8.
8.4	Compare	8.

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1. INTRODUCTION

1.1. GENERAL INFORMATION

The Philips PM3551 Logic Analyzer family comprises 4 models: PM3551/10, PM3551/30, PM3551/50 and PM3551/70, with each model containing features suitable for a variety of application needs.

This manual contains information to operate the whole range of models.

The PM3551/30 and PM3551/70 models are compact instruments whose easy-to-operate design offers the user a very comprehensive selection of Time, Data and Graph analysis features. The extensive measurement capabilities will enable the user to test and troubleshoot a wide range of digital systems, with the additional plus factor that the instruments are extremely well suited for use in a teaching environment.

The PM3551/70 model is capable of recording a maximum of 59 state channels and 8 50MHz timing channels while the PM3551/30 although identical in design and operation is capable of measuring a maximum of 35 state channels and 8 50MHz timing channels.

The PM3551/10 and PM3551/50 models have the same features as the above mentioned PM3551/30 and PM3551/70 models with the exception of the "50MHz Timing Analyzer" mode.

The operator control panel is divided into several functional areas which guide and help the user to set up the most effective test procedure.

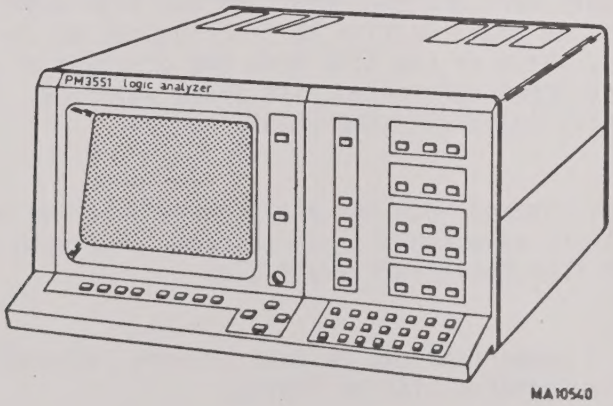


Fig.1.1. Logic Analyzer PM3551

1.2. FEATURES

A functionally organized keyboard/softkey structure in combination with an interactive menu-display serve the user in setting up and entering parameters for triggering, capturing, comparing and counting the activities of the system under test.

The extensive triggering capability of the 8 sequential trigger-words, that can be combined with clock and trigger-qualifiers, permits capturing data from complex system activities or from deep branched or nested loops. Each trigger-word has the same width as the number of input channels of the various models.

The sequence of the different trigger-words used can be defined by the use of an IF, THEN, ELSE algorithm, with the possiblity of placing a certain amount of delay between the statements.
In this mode, triggering can be selected as True or False.
A notable feature of this mode is that the selected trigger sequence can be specified as true or alternatively as not true. This latter mode is called "Trigger on Sequence Break" mode and provides the capability of triggering when a defined repetitive pattern (eg. a loop or a polling sequence) is broken or not executed in the specified order.

The moment of capturing data can be delayed by states and/or trigger occurrences and/or time.

The Logic Analyzer can also be used for making time measurements.
A readout of the elapsed time between two points in for example a service-routine, sub-routine or interrupt-routine can be obtained.

Special features of note here are the COMBI and the SYNC modes.
The COMBI mode allows the state section to be triggered by the timing section or vice-versa, while in the SYNC mode the displays of a number of timing channels are cross-referenced with state sampling. This enables analysis of critical state/time relationships.

Data to be captured is clocked into the analyzer on selected clock edges of one of the three selectable clock sources. For each clock used, there are up to four qualifiers available.

In the COMPARE mode, a comparison can be made between captured data and stored data in the formats: List or Timing.

The analyzer automatically stores or displays the latest set-up, when switching on or off the instrument. All analyzer models can be equipped with the option to store up to 4 additional set-ups.Here each set-up is stored and retrieved by a code, entered through the keyboard.

In the TIMING mode, glitches of a duration of as little as 5 nanoseconds can be captured from the data-stream.

When powering up the analyzer, a self-test routine is automatically initiated. If a fault is encountered during this self-test, an appropriate diagnostic message will be displayed.

The PM 3551 can be equipped with a 4 channel 300MHz timing option, independently of the presence of the 8 channel 50 MHZ section. This allows high precision timing measurements.

Other options are the RS232-C Serial interface which enables connection of a printer or cassette, the IEEE 488 Parallel interface and the Disassembly packages.One interface can be installed, and it is a prerequisite for installation of a Disassembly option.
The Disassembly (Disa) option allows the user to view captured data in the mnemonic language of the most currently available 8 and 16-bit microprocessors.

Data is entered into the analyzer via 8-channel probe pods, each pod containing its own threshold adjustment. A variety of convenient pod attachments are available for connecting the system under test to the analyzer.

A built-in test program can be used as an aid to test the various functions of the analyzer and to assist in isolating any failures detected.

2. CHARACTERISTICS

The instrument has been designed and tested according to IEC Publication 348 for Class I instruments and has been supplied in a safe condition. The present Operating Manual contains information and warnings which should be followed by the purchaser to ensure safe operation and to maintain the instrument in a safe condition.

Properties expressed in numerical values with stated tolerances are guaranteed for ambient temperatures of +5 deg.C ... +40 deg.C unless stated otherwise. Numerical values without tolerances are typical and represent the characteristics of an average instrument. This specification is valid after the instrument has warmed up for 15 minutes.

OPERATION MODES:

- Logic State Analyzer only
- Logic Timing Analyzer only
- Combi Mode where the LSA can trigger the LTA or vice-versa
- SYNC Mode where LTA is cross-referenced with the LSA

NOTE:

- For operation and selection procedures about these modes, see Chapter 4.

MODELS:

Type-numbers	PM3551/10	PM3551/30	PM3551/50	PM3551/70
No of State Channels	35	35	59	59
No of 50MHz Timing Channels	-	8	-	8

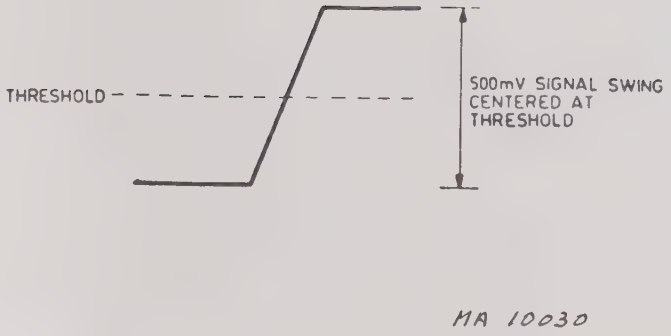
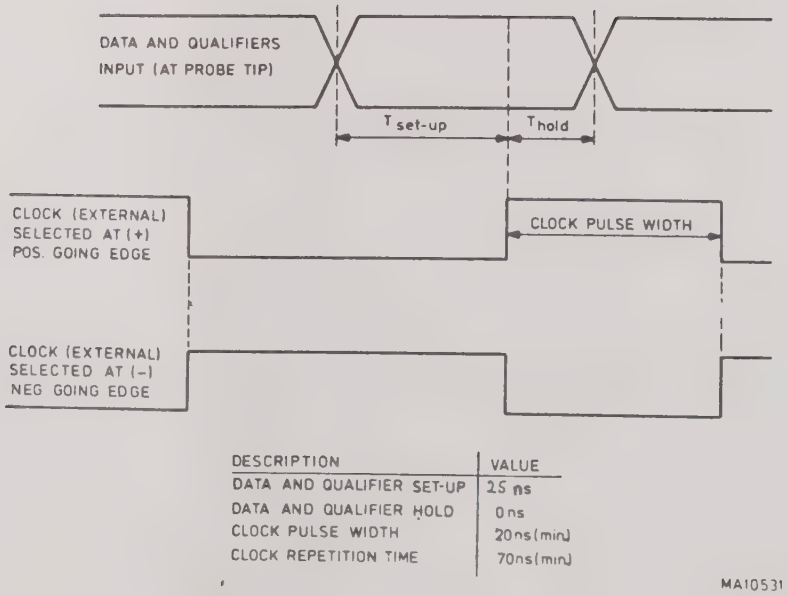


Fig.2.1 Minimal signal swing



DESCRIPTION	VALUE
DATA AND QUALIFIER SET-UP	25 ns
DATA AND QUALIFIER HOLD	0 ns
CLOCK PULSE WIDTH	20ns(min)
CLOCK REPETITION TIME	70ns(min)

Fig.2.2 Definition of terms and times

2.1 LOGIC STATE ANALYZER

Data Input	: PM3551/10; 35 channels maximum via 5 Pods PM8821 PM3551/30; 35 channels maximum, 27 via 4 Pods PM8821 + 8 via 1 Pod PM8825 PM3551/50; 59 channels maximum via 8 Pods PM8821 PM3551/70; 59 channels maximum, 51 via 7 Pods PM8821 + 8 via 1 Pod PM8825
Pod Type	: PM8821 and PM8825 multi-lead probe Pods to be connected at the rear of the instrument.

Following values are typical values and specified at the probe tip(s)

Impedance	: 4 MOhm//6 pf
Max. input voltage	: -50 V to +50 V
Threshold	: Software selectable per pod. Fixed TTL, ECL or variable selectable per pod between -3 V and +12 V in steps of 100 mV.
Max. sensitivity	: 500 mV pp signal swing, centered on the threshold voltage (see Fig. 2.1).
Set-up and hold times	: Data set-up time minimum 25ns Data hold time minimum Ons Both related to the active clock edge at the probe tip (see Fig. 2.2).
Data aquisition	: Data collected is selectable from: a. states i.e. all combinations at inputs are clocked in. b. occurrances i.e. only certain types of words are acquired. c. combination of both.

Clock

Source	: External (synchronous) clocking.
Number of clocks	: Three separate clocks can be acquired via 3 leads of one multi-lead probe Pod PM8821.
Threshold	: Same specification as data input (see also Fig. 2.1).
Impedance and max. input voltage	: Same specification as data input

Clock repetition time	: Min. 70ns
Clockpulse width	: Min. 20ns (see Fig. 2.2).
Sampling	: Selectable on positive or negative clock edge.

Clock qualifiers

Number	: 2...4 clock qualifiers (input via one multi-lead probe Pod PM8821) Two clock qualifiers are fixed, the other two are interchangeable with two data channels.
Threshold	: Same specification as data input (see also Fig. 2.1).
Impedance and max. input voltage	: Same specification as data input
Sampling	: At clock edge and at selected qualifier level. True and False combinations are possible (see Fig. 2.2).
Selection	: "1" for a high level "0" for a low level "X" for don't care (qualifier not in use).
Set-up and hold times	: Data set-up time minimum 25ns Data hold time minimum 0ns Both related to the active clock edge at the probe tip (see Fig. 2.2).

Memory

Format	: The memory depth is 1K (=1023) bits per channel. A second memory of the same size is available for compare mode operation.

Triggering

Source	: 1) Internal, 2) Manual or 3) External (External socket TRIG IN is also input for trigger qualifier)

1) Internal : Triggering on up to 7 words, each delayed by a delay count, can be selected for:

. Parallel and Quasi parallel triggering

. Sequential triggering (ARM word(s) enable the TRIG word)

. Immediate Sequential Triggering. Word N must be followed immediately by word N+1.

For all trigger modes, all combinations can be made with up to 7 words, clocks and delays.

Trigger words can be selected for "true" or "false" triggering.

The number of triggers can be preset and counted (see: Delay and Counter).

2) Manual : Operator controlled STOP.

3) External i.e. external trigger or trig. qualifier : Via input socket TRIG IN and PM8800 or PM 8810 probes. This input acts as an enable for the internal trigger logic and is selectable as edge or level active.

The external input offers the following possibilities:

. When the internal trigger word is set as all don't cares, this input acts as an external trigger.

. When the internal trigger word is defined this input acts as a trigger qualifier.

. Connection for PM8810 Logic Trigger Probe

Following values are typical values and apply only when the specified probe is used.

Input Impedance	: 5 MOhm // 15 pf
Max. Input Voltage	: $\pm$ 50 V
Threshold	: Fixed TTL
Sensitivity	: 500 mV_{pp} signal swing (see Fig. 2.1)
Set-up and hold times when PM8800 is used	: Signal set-up time minimum 30ns Signal hold time minimum 0ns Both related to the active clock edge at the probe tip (see Fig. 2.2).

Set-up and hold times when PM8810 is used	: Signal set-up time minimum 50ns Signal hold time minimum 5ns Both related to the active clock edge at the probe tip.
Delay	: In the trigger menu, delay can be specified in the range of 0 to 64k steps - as states of clock(s) - in occurrences of word(s) - in time
Outputs	: MATCH OUT; TTL level, high is true, when a trigger word occurs. RUN OUT; TTL level, high is true high is true, during data acquisition. (outputs via BNC connectors at rear side)
Input	: TRIG IN (input via BNC connector at rear side)

Selective data acquisition

Selection	: Up to two different blocks of selective data acquisition can be selected.
Block limits	: Start on a certain word or on START. End on a certain word, word+trigger delay, or END.
Selected data	: Samples on specified clock(s). -A specific word and samples on specified clock(s). -One specific word. -A specific word followed by a number (max. 255) samples on specified clocks. This can be limited by a max. repeat of 512
Counter	: In Selective data menu, between specified start and finish, a counter can count: -Samples with specific clock(s) -Specific words -Time

2.2 LOGIC TIMING ANALYZER

Data Input	: 8 channels timing via 1 Pod
Pod Type	: PM8825 multi-lead Pod to be connected at the rear of instrument.

Following values are typical values and specified at the probe tip(s).

Impedance	: 1 MOhm // 5 pf
Max. Input voltage	: -50V to +50V
Threshold	: Software selectable; Fixed TTL,ECL or variable selectable between -3 V and +12 V in steps of 100 mV.
Max. sensitivity	: + 200 mV. with respect to threshold. level.
Minimum pulse width	: 24ns (i.e. 1 sample period + 4ns).
Channel to channel skew	: $<$3 ns
Glitch detection	: Selectable over all 8 channels. Glitches from 20ns sample period down to 5ns, selectable by user.

Clock

Source	: Internal Fixed 20 ns (i.e. 50 MHz), transitional clocking system (refer to .... for explanation of transitional clocking).

Memory

Depth	: 1/4 K bits per channel. (recording up to 256×10^6 samples)

Triggering

Source	: 1) Internal, 2) Manual, 3) External and 4) Glitch
1) Internal	: 3 modes: Word Word + Glitch Glitch after window Triggering selectable on leading or trailing edge of word match. Timing and State can be combined in COMBI mode and SYNC mode.
2) Manual	: Operator controlled STOP.
3) External	: Via input socket TRIG IN and PM8800 probe. This input is edge active. Values apply only when the belonging PM8800 probe is used. This input can be used as input for a trigger- or glitch qualifier signal, refer also to next point 4.
Input impedance	: 5 MOhm // 15 pf
Max. input voltage	: $\pm$ 50 V
Threshold level	: Same voltage at PM 8800 probe tip as at input of PM 8825 Pod.
Sensitivity	: 300 mVp-p with respect to threshold level.
Min. pulse width	: 5 ns.
4) Glitchtriggering	: Triggering on glitches on one selected channel with a selected glitch width of minimum 5 ns. up to a maximum of N sample intervals where N is selectable between 1 and 15. One sample interval is 20 ns.
Glitch window	: Defining a window by an arming word (start) plus a delay (finish) within which the analyzer is looking for glitches.
Glitch-qualifier or Trigger-qualifier	: Via input socket TRIG IN and PM8800 probe with the same characteristics as "External" point 3). Used as glitch-qualifier an extra trigger condition is added to the glitch-triggering e.g. to control a glitch window. Used as trigger-qualifier it enables the selected timing triggerword to be extended with one bit.

Delay	: 1) Time delay and 2) final delay
1) Time delay	: Max. 20 x 2^{20} nsec. =20971 usec. via a 20 bit counter which counts in steps of 20 nsec.
2) Final delay	: Max. 255 transitions
Output	: MATCH OUT: ECL level, high is true, when the selected trigger word is true. (output via BNC connector at rear side)
Input	: TRIG IN: (input via BNC connector at rear side).

2.3 OPERATION

Operation is by key actions combined with various data or menu displays. The keys are divided into two key fields, see also front panel layout, Fig.3.2 :

Front panel keys	: Allow user direct access to the analyzer display modes and control functions.
Key-board keys	: Allow the user to enter the required parameters within a display mode. This keyboard is based on a combination of hard-keys (for cursor control and HEX value entry) and soft-keys (when entry is not a HEX character).

2.4 DISPLAY

The display is a green phosphor 9 inch video display.
This video display can show a maximum of 24 text lines when the instrument is in a full menu mode.
When in data display mode the display is divided into three fields (see also front panel layout, Fig.3.2) :

Heading	: The top 6 lines of the display which contain a condensed menu display.
Data field	: The centre 16 lines of the display. This area contains the data display.
Softkey function field	: The bottom 2 lines of the display which display the functions of the softkeys located under the display.

EXTERNAL DISPLAY : Via BNC output connector COMP VIDEO at the rear side of the instrument.

- Display scan : Non-interlaced
- Number of display lines : Total 312, visible 256
- Cable matching impedance : 75 Ohm
- Polarity : High level is bright
- Sync pulses : 20%...40% of total
- Line frequency : 15600 Hz
- Frame frequency : 50 Hz
- Max video bandwidth : 10,7 MHz
- External display timing : See figure 2.3.

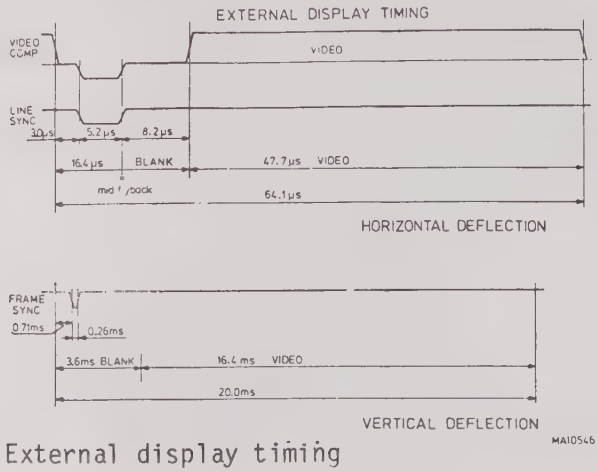


Fig.2.3 External display timing

2.5 DISPLAY MODES

Data display : State list display; binary,octal,decimal, hexadecimal, ASCII or combinations of these. Inverted display by groups or by individual channels is possible.

: Timing display; 8 channel format, vertical expansion by channel delete, horizontal scale continuously controllable.

: Graphic display; data magnitude is plotted against time sequence.

Menu display : For specification of parameter set-ups the following menus can be displayed:
- Configuration menu
- Trigger menu (State or Timing)
- Data acquisition menu
- Compare menu
- Option menu

2.6 COMPARE MODE

Memory	: A reference memory is available to store the contents of the acquisition memories of both state and timing. This memory can also be loaded via the optional interface.
Store	: With the store function, data contained in the acquisition memory is copied into the reference memory.
Modes	: Full compare: The two entire memories are compared Compare Mask: Channels over which the compare takes place and the limits of the compare with respect to the trigger point are defined by the user. Offset: Shift of stored data (masked) with respect to current data. Skew: Timing only This allows deviation of an edge in the current data with respect to stored data. Search: Stops continuous compare process when an inequality is found, or counts equalities or inequalities.

2.7 POWER SUPPLY

AC Supply	: Double Insulated	Safety Class I IEC-348, ECMA-57
Power consumption	: 130 VA : 250 VA : 180 VA : 280 VA	PM 3551/10 PM 3551/30 PM 3551/50 PM 3551/70
Nominal mains-voltage ranges	: 110...127 Vac $\pm$ 10% or 220...240 Vac $\pm$ 10%	Mains fuses 4A delayed (2x), both mains-voltage ranges
Nominal frequency range	: 50...60 Hz $\pm$ 10%	
Capacity to earth	: 110 pf : 23 pf	Measured with rubber feet on earthed metal plate of 1 m^2. Measured 30 cm above earthed metal plate

2.8 ENVIRONMENTAL CHARACTERISTICS

The characteristics are valid only if the instrument is checked in accordance with the official checking procedure. Details of these procedures and failure criteria are supplied on request by the PHILIPS organization in you country, or by N.V. PHILIPS' GLOEILAMPENFABRIEKEN, TEST AND MEASURING DEPARTMENT, EINDHOVEN, THE NETHERLANDS.

-CLIMATIC CONDITIONS

Ambient temperature

Rated range of use	+ 5 ...+ 40 Deg.C	
Limited range of operation	0 ...+ 45 Deg.C	
Limited range for storage and transport	-40 ...+ 70 Deg.C	

Relative humidity

Rated range of use	20% ... 80%	Non condensing
Limited range for storage and transport	5% ... 95%	
Recovery time	1 hour	If the instruments temperature is raised from -10 DegC to +20 Deg.C at 60% relative.

Altitude

Rated range of use	up to 5000 m.	
Limited range for storage and transport	up to 15000 m.	

Mains Interruption

	10 ms (nominal mains supply)	No influence on settings and data storage.

-MECHANICAL CONDITIONS

Vibration

Rated range of use	Negligible value	
Limited range for storage and transport	0.28 mm(p-p) max. 20 m/s^2	Frequency range 10 ... 150 Hz

Bump

Rated range of use	10 m/s^2	6 ms
Limited range for storage and transport	100 m/s^2	1000X, 6 ms in each of 3 directions

Electromagnetic Compatibility (EMC)

Electromagnetic Interference (EMI)

Conducted interference	level B 10 kHz ... 30 MHz	VDE 0871
Radiated interference	level B	VDE 0871

Electromagnetic susceptibility (EMS)

Conducted susceptibility

Transients on mains connections (ingoing)		Assymetrical only

Fast low energy pulses

Pulse height	1500 V max.	No damage to occur
Rise time	35 ns. max.	
Pulse width	100 ns. approx.	
Source impedance	150 Ohm max.	

2.9 PHYSICAL CHARACTERISTICS

Dimensions

Width	450 mm
Heigth incl. feet	242 mm
Heigth excl. feet	227 mm
Depth max.	570 mm
Depth min.	496 mm

Weigth

Net, without accessories and options	17 kg(approx.)

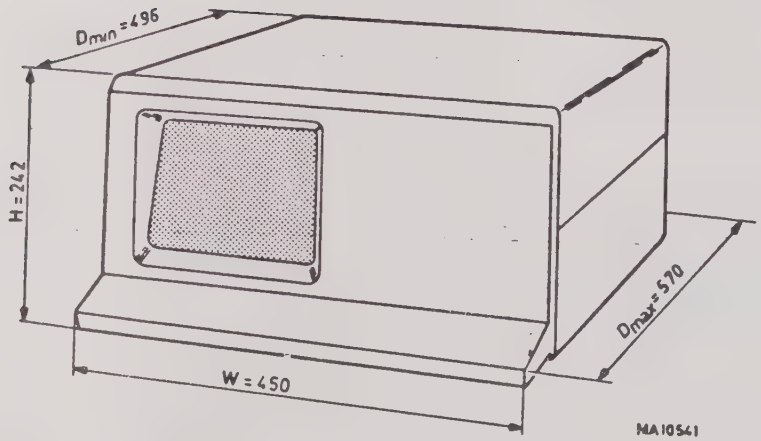


Fig.2.4 Dimensional drawing

2.10 ACCESSORIES AND OPTIONS

-Standard accessories:

1 Operating manual		
5 Multilead probe pods	(with PM 3551/10)	PM 8821
4 Multilead probe pods	(with PM 3551/30)	PM 8821
8 Multilead probe pods	(with PM 3551/50)	PM 8821
7 Multilead probe pods	(with PM 3551/70)	PM 8821
1 Multilead probe pod	(with PM 3551/30 & /70)	PM 8825

-Optional accessories:

PM 8800	External trigger qualifier probe (set of four probes)
PM 8810	Logic trigger probe
PM 8811	Serial data pod
PM 8817	uP personality adaptor
PM 8819/00	Extension kit (leads, clips, adaptor)
PM 8819/10	54 Coloured leads
PM 8819/20	35 Measuring clips
PM 8819/30	
PM 8819/40	

-Instrument "upgrading" options (These options are field-installable):

PM 8851/30	8 Time channels 50 MHz
PM 8851/50	24 State channels
PM 8851/70	4 Time channels 300 MHz
PM 8851/20	Printer + RS 232C interface
PM 8851/40	Printer + IEEE 488 (IEC 625) interface
PM 8850/10	DISA N (Intel Disassembler)
PM 8850/20	DISA M (Motorola Disassembler)
PM 8850/30	DISA Z (Zilog Disassembler)
PM 8850/40	DISA R (Rockwell/RCA/NS Disassembler)
PM 8850/80	Non-volatile memory for storage of 4 user defined parameter set-ups

Note: For more information refer to the section "Information concerning accessories and options"

3.0 GENERAL DIRECTIONS

3.1 WARNINGS AND INFORMATION FOR THE USER

- It is recommended that this section is read completely before switching on the instrument.
- This instrument has been designed and tested in accordance with IEC Publication 348, Class 1, Safety Requirements for Electronic Measuring Instruments and has been supplied in safe condition. This Manual contains information and warnings, all of which must be considered to ensure safe and reliable operation of the instrument.

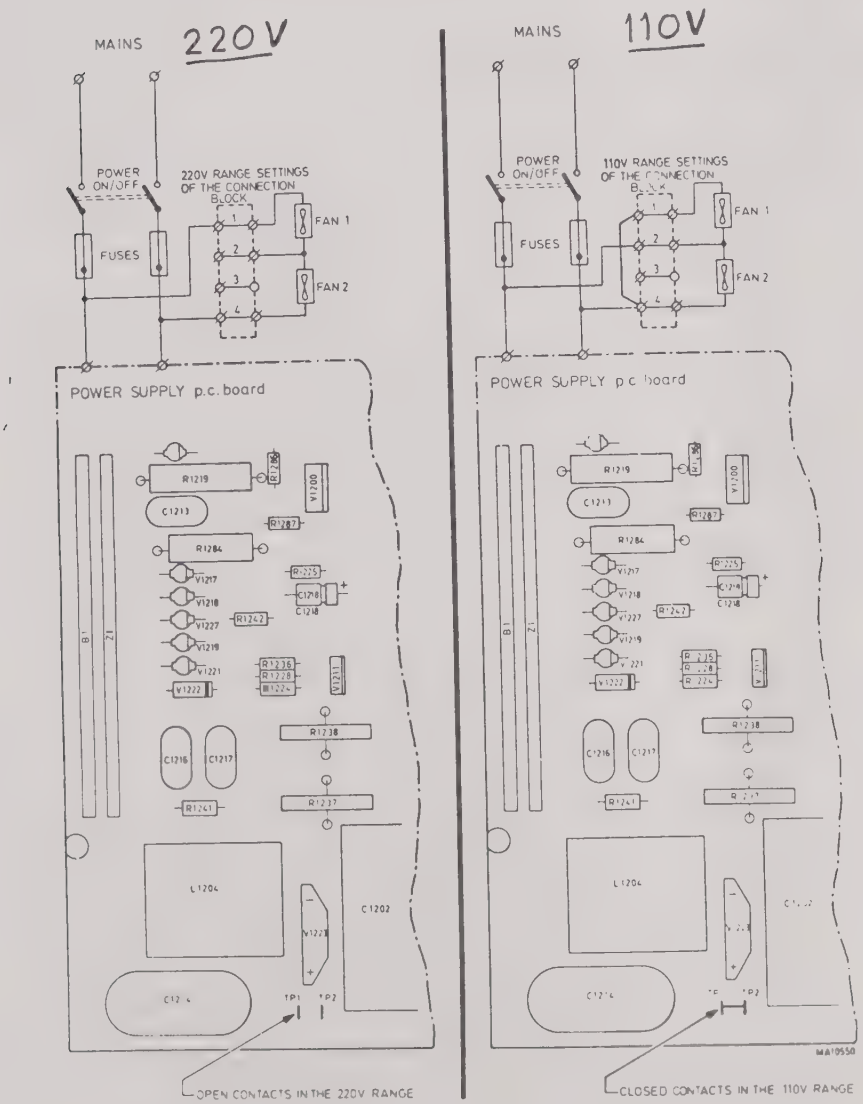


Fig. 3.1 Connecting for 220 V or 110 V range mains voltage.

Mains adaption

- Before connecting the instrument to the mains supply, ensure that it set to the correct voltage range. To do this, the upper cabinet plate has to be removed and it can be seen if some connections of the power supply compartment are set to the relevant voltage range. Range settings are shown in figure 3.1.
  New instruments are shipped with the voltage range setting correct for the country of destination.

Earthing

- Before switching on, the instrument shall be connected to a protective earth conductor in one of the following ways:

  . via the protective earth terminal at the rear of the instrument, identified by the symbol (⏚.
  . via the earth wire in the three-core mains cable.

  The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension cord without protective conductor. Replacing the mains plug is at the user's own risk.

  WARNING: Any interruption of the protective conductor inside or outside the instrument, or disconnection of the protective earth terminal, is likely to render the instrument dangerous. Intentional interruption is discouraged. When an instrument is brought from a cold to a warm environment, condensation may cause a hazardous condition. Ensure, therefore, that the earthing requirements are strictly adhered to.

Cooling

-Take care that the forced air flow through the instrument is not obstructed. Do not place any instruments or papers on the top of the instrument to avoid excessive heating-up.
-Do not use the instrument when the built-in fans are not running.

Adjustment, replacement of parts and repair

- When the instrument is connected to the mains, terminals may be live, and the opening of the covers or the removal of parts (except those to which access can be gained by hand) is likely to expose live parts.
- The instrument shall be disconnected from all voltage sources before it is opened for any adjustment, repair, replacement or maintenance.
- Capacitors inside the instrument may still be charged even if the instrument has been disconnected from all voltage sources.
- Any adjustment, repair or maintenance of the instrument, when opened under voltage, should be avoided as far as possible, and, if inevitable, should only be carried out by a skilled person who is aware of the hazards involved.
- Never remove a circuit-board or component until the instrument has been switched-off for at least one minute.
- Ensure that only fuses with the required rated current and of the specified type are used for replacement.
  The use of make-shift fuses and the short-circuiting of fuse holders is prohibited.

Maintenance

- Cooling
  Check the vent holes and the dust filter (located in the bottom plate) once a year.
  If necessary free the holes (use pressurized air).
  When the filter is clogged with dust, it must be replaced.
  Ordering number dust filter: 5322 480 40142.

- Cleaning
  If necessary, the VDU glass surface, the front panel, and the cabinet-plates may be cleaned with a soft pad, cloth, or cotton-wool with some water and common houshold cleansing, or some alcohol or white spirit.
  Do not use abbresive cleaning pads or materials.

Nickel-cadmium battery

The non-volatile instrument setting memory is energized by a 3.6V nickel-cadmium battery located on the video interface unit (VIU-1).
This battery requires no special maintenance.
Bad battery condition is generally indicated by the message SETTING INVALID when selecting a saved or stored setting.
A battery in bad condition must be replaced (call your local Philips Service Organization).

Note that this battery may never be opened, nor short-circuited, nor be thrown in open fire.

Defects and abnormal stresses

- Whenever it is likely that the protection has been impaired, the instrument should be made inoperative and secured against any further operation.
- The protection is likely to have been impaired if, for example, the instrument:

  . shows visible damage.
  . fails to perform its intended functions.
  . has been subjected to prolonged storage under unfavourable conditions.
  . has been subjected to severe stresses during transport.

Power up self test

- When switching-on, the microprocessor initiates a test program wherein it checks the immediate microprocessor environment, keyboard and memories.
  If this test gives a faulty result, the C.R.T. remains blank.
  If a RAM is faulty, the wrong address is displayed binary.

Service test

- The instrument is provided with a service test program as an aid to pin-point any functional defect. This program is selected by pressing - and - pushbuttons simultaneously.
  The service test program consists of a number of separate test modules, sequentially activated. The first module is entered when selecting the test program. A test module is dealing with a particular way of testing or with the testing of a particular part of the circuit. By depressing the - pushbutton the next testmodule is entered. Pressing the - and - pushbuttons simultaneously leads to a return back to the operational program.
  More information about the "service test" will be given in the (separate) SERVICE MANUAL of this instrument.

Turning power on

- The instrument is turned on by switching the power ON/OFF switch at the rear of the instrument to ON. See also figure 3.3
- Check that the built-in fans are running.
- The initial configuration menu appears on the display.

3.2 DESCRIPTION OF CONTROLS, CONNECTORS AND DISPLAY

This section describes the operation and function of controls and sockets on the instrument. The front panel's functional areas as well as the controls in those areas are explained in the sequence they would normally be used by the operator.

3.2.1 F R O N T P A N E L

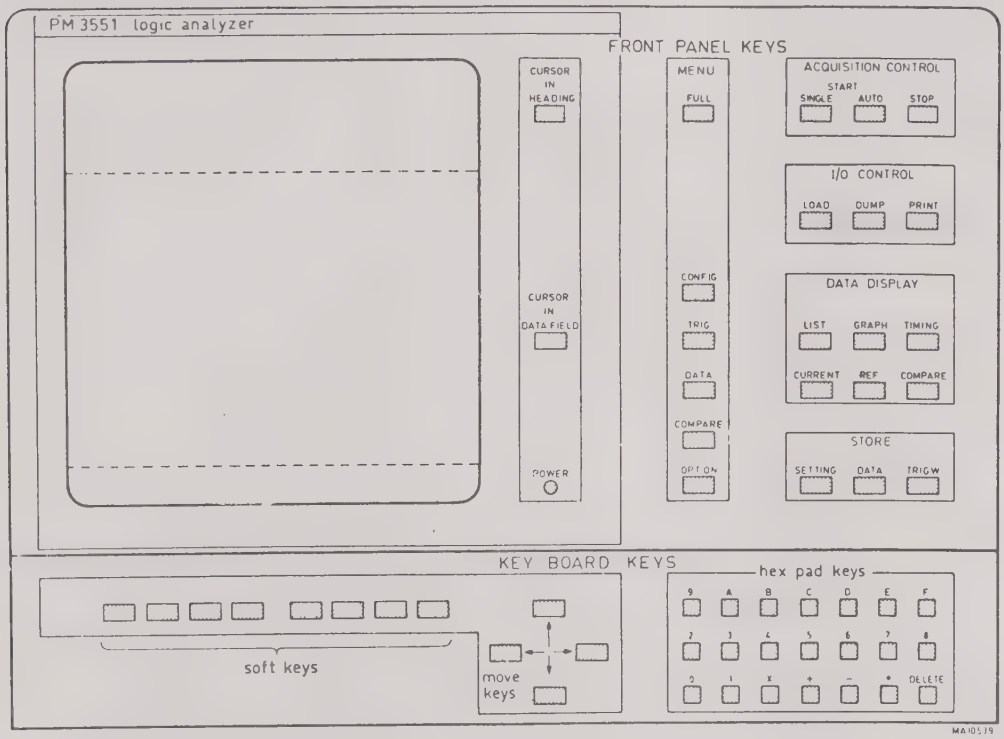


Fig. 3.2 Front panel

CURSOR position area

CURSOR IN HEADING : This button forces the cursor into the heading (this is the condensed menu).

CURSOR IN DATA FIELD : This button forces the cursor into the data field.

The cursor can be located on one character only, or on a group of characters. The cursor is indicated in reverse video.
The cursor can be moved with the four move keys.

POWER (lamp) : Indicates that the instrument is switched-on. (The main switch and fuses are located at the rear panel).

MENU area

FULL : Selects a Full menu (refer to Menu Description).
CONFIG : Selects the Configuration menu
TRIG : Selects the Trigger menu
(When both the State- and the Timing analyzers have been selected, this key gives alternatively the state- and the timing trigger menus)
DATA : Selects the Data menu
COMPARE : Selects the Compare menu
OPTION : Selects the Options menu

ACQUISITION CONTROL area

START SINGLE : Starts a single shot data acquisition action.
START AUTO : Starts an automatic restart data acquisition action.
STOP : Stops data acquisition in single, as well as in auto mode.

I/O CONTROL area (only active if an interface option has been installed)

LOAD : The analyzer memory is loaded with data from a storage device, or controller.
DUMP : The analyzer memory contents is transferred to a storage device or controller.
PRINT : The analyzer memory contents is transferred to a printer.

DATA DISPLAY area

LIST : Memory contents is displayed in a list format.
GRAPH : Memory contents is displayed in a graph format.
LIST and GRAPH display apply only to the State Analyzer.
TIMING : Memory contents is displayed as blockform signals
This applies only to the Timing Analyzer.

CURRENT : The contents of the current memory is displayed.
REF : The contents of the reference memory is displayed.
COMPARE : The contents of the current memory and the contents of the reference memory are compared.

STORE area

SETTING : The settings of the analyzer are stored
(only if an option PM 8850/80 has been installed).
DATA : The contents of the current memory is copied into the reference memory.
TRIGW : The cursor word (which is the uppermost word of the displayed data list) is copied into the cursored trigger word in the trigger menu.

SOFTKEYS

There are 8 softkeys, located directly underneath the display.
Each active softkey function is displayed in inverse video, just above the key. A disabled softkey function is presented in normal video.

MOVE KEYS (scroll,shift)

These keys have two functions:
-Positioning of the cursor in the menus, or in the label line in the data field.
-Scrolling the data list, or horizontal shift of the timing display window.

HEX KEYS

The hex keys (0---F) permit hexadecimal input for the various settings.

X	= don't care
.	= decimal sign
DELETE	= deletes full numerical input

3.2.2 REAR PANEL

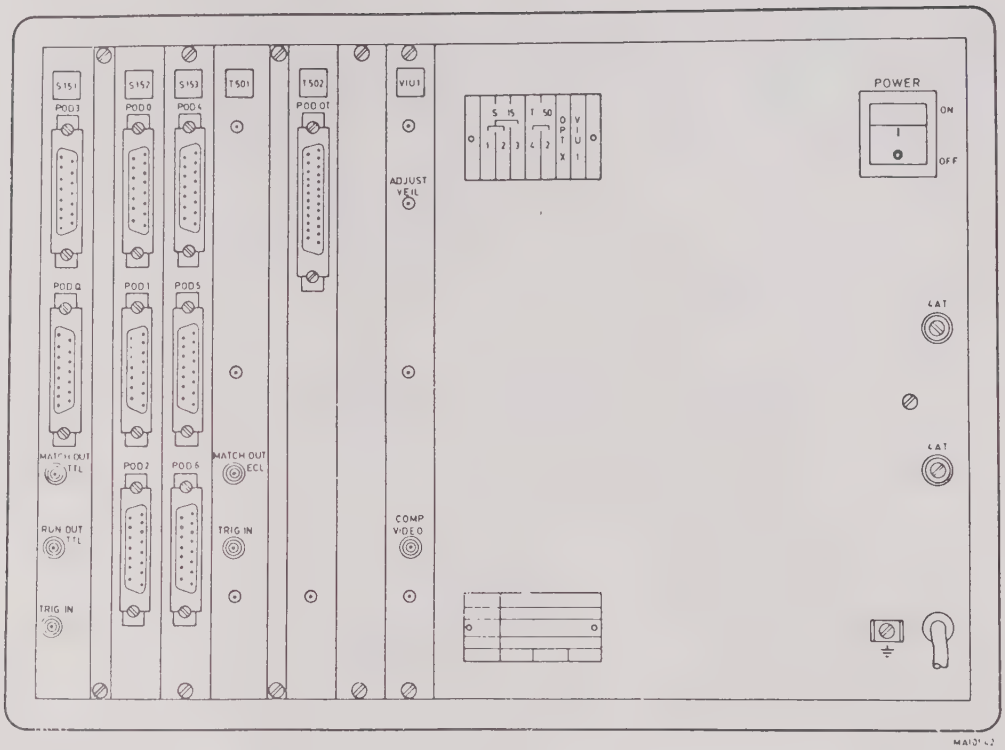


Fig. 3.3 Rear panel

Seen from the rear, you find from left to right the following unit indication:

-S15.1 S15.2 S15.3 (the latter only in versions /50 and /70)
S indicates State Analyzer p.c. boards.

-T50.1 T50.2 (both only in versions /30 and /70)
T indicates Timing Analyzer p.c. boards.

-OPT.X (instructions for field fitting are given in the service manual, and are delivered with the option).
p.c. Board for instrument options.

-VIU.1 (video interface unit)
Video interface p.c. board.

On above mentioned units you will find the following:

1 State section

On S15.1 and S15.2 the input connectors are located for POD#0, POD#1, POD#2, POD#3 and POD#Q.
The POD#0 input is not present in the /30 and /70 models, where POD#0 data is taken internally from the Timing POD PM 8825. So Pod#0 data can then be displayed in a list as well as in a timing diagram.

POD#0...POD#3 are data inputs; POD#Q is input for clocks and qualifiers (two of the qualifiers may be used as data channels).
On S15.3 the input connectors are located for POD#4, POD#5 and POD#6.
All these inputs are 15 pins input connectors to connect PM 8821 PODs.

On S15.1 three BNC connectors are present:
-MATCH OUT delivers a active high TTL signal if a trigger word occurs.
-RUN OUT is delivering a active high TTL signal during data acqusition, i.e. between start and stop (final triggering).
-TRIG IN features triggering of the data acquisition with an external signal. The external signal must be fed via the PM 8800 probe and is specified as TTL level at the probe tip.

2 Timing section

On T50.1 and T50.2 the following connectors are present:
-POD#0T 25 pins input connector for 8 timing channels (data input via POD PM 8825).
-MATCH OUT BNC connector, delivering a high active ECL signal during the time that the selected trigger word is true and clock pulse(s) is (are) present.
-TRIG IN BNC connector features triggering of the data acquisition with an external signal.
The external signal must be fed via the PM 8800 probe and can be selected between -3V and +12V at the probe tip. (Threshold is adjustable at the relevant p.c. board). An unused input is regarded as a "0".

3 Video Interface Unit (VIU):

-ADJUST VEIL allows brightness adjustment of the veil in the timing display.
-COMP VIDEO BNC output giving a video signal (1.25 Vp-p) to connect an external video display. This signal includes line- and frame sync pulses.

Mains section
-Mains switch
-Two fuses 4 Amps (delayed action) for both the 110V and 220V ranges. (see also Section 2.7.).
-Mains cord provided with gnd wire
-Separate gnd connection

Brightness adjustment
At the LEFT HAND SIDE of the instrument;
-Screw driver adjustment for brightness of the display.

4 DESCRIPTION OF THE MENUS

WHAT'S A MENU?

A menu is a survey of specific functions, parameters and values which apply to a certain analyzer mode.

There are full menus and condensed menus.
A full menu states full detailed information and requires the whole display area.
A condensed menu states just the most relevant information leaving room fora display field for data.

The following menus are selectable:
-Configuration menu
-Trigger menu state section
-Trigger menu timing section
-Selective data acquisition menu
-Compare menu
-Options menu

For each full menu a condensed menu is available (options menu excepted). Changes in a full menu are automatically copied in the corresponding condensed menu; changes in condensed menus are not all copied in the corresponding full menu.

Selectable functions are indicated by the cursor and the labels above the softkeys.
The cursor, which puts the selected function or value in inversed video, can be positioned with the four arrow keys.
Note that with each new cursor position, the softkey functions may change.

By pressing the relevant softkey the function or parameter is selected.

When you switch-off the instrument, all settings in the menus remain stored in a battery back-up memory. The configuration menu photographs in this chapter show the default values of the settings after switching on.

First we discuss the full menus.

4.1 FULL MENUS

4.1.1 CONFIGURATION MENU

General information

In this chapter we discuss the menus of an Instrument provided with 35 or 59 state channels and 8 timing channels, so skip numbers or functions which are not applicable in your Instrument.

Press the FULL- and the CONFIG key in the MENU area.
(after switching-on the instrument display shows always the initial full Configuration Menu)
Note that the current instrument setting is always saved in a battery back-up memory, when the mains voltage is switched off.
In the following we discuss the menus as in the initial setting.

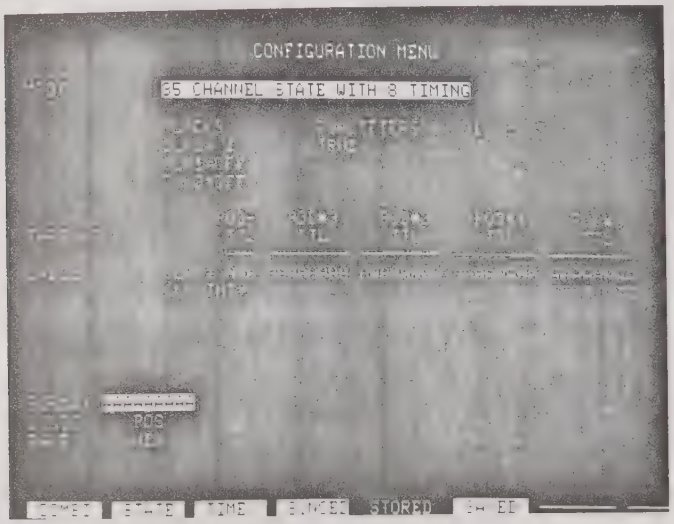


Fig. 4.1 Full Configuration Menu

MODE

The following modes are selectable:

COMBI — This mode applies typically for combinative use of both the State Analyzer and the Timing Analyzer. Each Analyzer is capable of enabling the triggering of the other Analyzer (LSA enables LTA, or LSA waits for LTA). Start data acquisition is common for both Analyzers.

STATE — In this mode your instrument is a State Analyzer only.

TIME — Now you have a Timing Analyzer only (max 8 channels).

SYNCED — The Timing Analyzer will now run synchronously with the State Analyzer. The Timing Analyzer being triggered by the ENABLE LTA command.
Both Analyzers work on their own sample clock, but reference is obtained between both captured data.
You will miss two timing channels; they are used for synchronization purposes between both analyzers.
Samples captured with the State Analyzer are marked in the timing diagram.

STORED — If your instrument has the PM 8850/80 option built-in, up to six different instrument settings can be selected.
If not, one complete instrument setting is always stored.

SAVED — Pressing this key recalls the complete instrument setting as it was when the instrument was switched off.
If the instrument setting was not correct at the moment of switching-off, the message INVALID SETTING will be shown when the saved key is pressed.

CLOCKS

Allows you to select the active clocks and clock-edges.
Also the corresponding qualifiers and their polarity can be selected.
Note that at least one clock must be selected.

DATA INPUT THRESHOLD AND CLOCKS VS. LABELS

In this field you can select labels per active clock, and the logic threshold voltage per Pod.
In the 35-channel state analyzer version this field consists of the following two fields.

THRESHOLD

A correct threshold voltage is important to obtain a reliable logic level detection of the input signals.
The threshold voltage is selectable per Pod.
You can select TTL, ECL, or VAR. VAR is any value between -3V and +12V, and must be entered via the HEX key pad.

LABELING

This function allows you to label groups of input channels; the same labels remain present in all further displays.
Available labels are A---G.
Channels of adjacent Pods can be grouped together by giving them the same label.
Labels may be allocated in any order in this field, but the resulted display format (see the FORMAT line) is always in alphabetical order.
Certain rules apply to the allocation of labels:
-Labels must be allocated on a contiguous block basis.
-The same label can be allocated to two or more clock sources, provided it covers the same channel inputs.

Note that the labeling is also related to the base-selection which is discussed in the next points.

Timing channels have basically label T (for timing) with a channel number. If the capture mode has been selected the label C applies.

LOGIC

This function and the BASE (see point 6) one have a combined cursor.
Logic applies to the logic (polarity) of the input signals.
Often positive logic is used, where '1' is a high voltage, and '0' is a low voltage.
An exception is e.g. IEEE/IEC bus logic, where a '1' is a low voltage and a '0' is a high voltage.
In this case pressing the NEG soft key will result in the active low systems signals being displayed as 1's.

BASE

The base is the numerical base, or the code in which the data will be represented.
The base can be binary, hexadecimal, octal, decimal or ASCII7.
The base selection is related to the above channel-labeling.
Generally a specific number of bits is used per base setting.
E.g. if octal base has been selected, the labeling must be in a group of three channels.
The value of non-activated bits in a group depends on the selected logic, selected threshhold, etc.

4.1.2 TRIGGER MENU

Press the FULL- and the TRIG key in the MENU area.

Note that in versions PM 3551/30/70 there are two trigger menus.
One for the state analyzer and one for timing analyzer.
In the COMBI-mode, these menus are alternately displayed by pressing the TRIG key.

State trigger menu

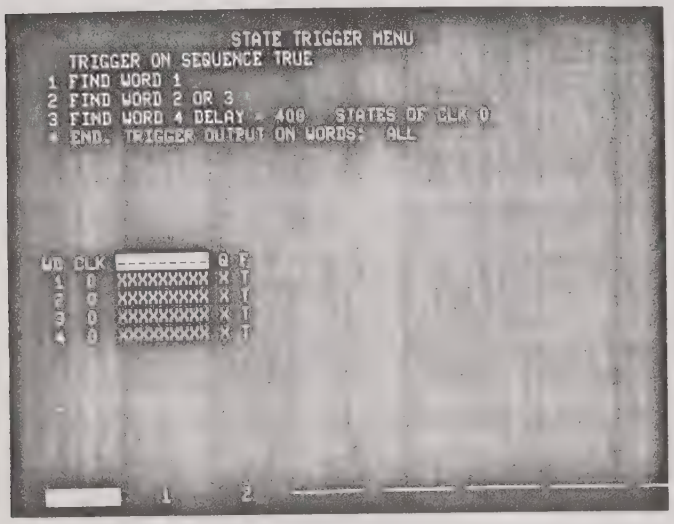

STATE TRIGGER MENU
TRIGGER ON SEQUENCE TRUE
1 FIND WORD 1
2 FIND WORD 2 OR 3
3 FIND WORD 4 DELAY = 400 STATES OF CLK 0
4 END. TRIGGER OUTPUT ON WORDS: ALL
WD CLK
1 0 XXXXXXXX X T
2 0 XXXXXXXX X T
3 0 XXXXXXXX X T
4 0 XXXXXXXX X T
1
2

Fig. 4.2 State Trigger Menu

This menu is divided in 3 main fields, from top to bottom:

STATE TRIGGER MENU

- TRIGGER ON SEQUENCE TRUE, OR -BREAK

- SEQUENCE
- -
- -

- TRIGGER-WORDS
- -
-

TRIGGER ON SEQUENCE TRUE, OR -BREAK

1. Trigger on sequence true
   In this mode a number of conditions must be fullfilled in a specific order to obtain triggering.

2. Trigger on sequence break
   A number of conditions must be sequentially fullfilled; if the sequence is broken triggering occurs.

SEQUENCE

In this field you can write the trigger sequence order.
This list is divided in steps, numbered from 1 onwards.
The various trigger words are labelled as 1--6 (or 7).
You can enter trigger words, delays, if-then-else conditions and so on.

Note that these trigger words can also be used in the selective data acquisition- and the compare menu.
For detailed information on the trigger sequence possibilities refer to chapter:

Note that in the Combi mode linkage can be made between the State-analyzer- and the Timing analyzer triggering.
Two functions are possible:
-Enable LTA : The State analyzer enables triggering of the Timing analyzer.
-Wait for LTA : The Timing analyzer enables triggering of the State analyzer.

TRIGGER WORDS

Trigger words are initiated in the trigger sequence list.
As soon as a word has been selected in the sequence list, it appears in the 'don't care'-form in the trigger word list.

Words 1--6 are the principal trigger words. Each of these words can also be used by a delay counter (delay on occurences) in the trigger step were it is used as the trigger word.
At the same time, each of the words 1--6 may be used with:
-the selective data acquisition, to define start and stop of sample windows.
-the counter, to define start and stop of the counter window.
-the compare function, to define the start and stop of the memory block to be compared.

Two more words, word A and word B, are available:
They can be used as:
-an occurances delay counter in every trigger step
-a word to be captured by selective data acquisition
-a word to be counted by the counter
In addition word B can also be used as a trigger word in the trigger sequence; in this case word B is labelled as word 7.

In the heading of the trigger word list you find:

WD CLK ^LABELS¨ Q F

In which:
WD is trigger word number.
CLK is the clock source for that trigger word.
^Labels¨ is the indication of the selected channel labels.
Q is the polarity of the trigger word qualifier signal.
F is the definition (true or false) of the trigger word with qualifier.

In the trigger word list you find the trigger words as soon as they are initiated in the trigger sequence list.

Note that clock numbers, qualifiers, and the True or False condition are enterend via the softkeys.
The trigger word itself is entered via the hex keyboard.

Softkeys

In the following we give an example with some principal trigger functions. In this example we succesively pressed the left-most softkey.
For more information on trigger functions refer to chapter. 8.2.

TRUE BREAK ----- ----- ----- ----- ----- -----

selects the main trigger mode.
Sequence TRUE means triggering after fulfilment of all trigger conditions.
Sequence BREAK means triggering is obtained if a trigger word is found which is not in the right sequence.
In the sequence break trigger mode, one trigger word per step can be set. Each trigger word may be with or without delay, the last word refers (with a GOTO statement) to a word earlier in the list to obtain the sequence.

If the initial setting TRUE is desired, press the -> or V key to proceed.

-------FIND WORD------
1 1->2 1 OR 2 ----- ----- ----- END EDIT

The Find Word keys control the trigger word selection in this step.
1 = find word 1
1->2 = find word 1, immediately followed by word 2 (next clock sample; no matter which clock).
1 OR 2 = find word 1 or word 2 (this can be:
a Boolean relation:
find word 1 or find word 2,
or a conditional relation when combined with If ---- Then ---- statement.

END puts the END statement in the next step, after which the trigger output signal(s) can be selected, if required.
The END statement is not selectable in the first step.

EDIT The sequence list is aborted from the cursor position downwards, permitting easy modification.

```
                          -----LTA-----
DELAY  -----    -----     ENABLE   WAIT    NEXT    -----    -----
```

DELAY If this key is pressed, the delay value can be entered via the decimal keys of the hex key pad.
After entering the delay value use the appropriate soft key key to obtain the unity of delay being selected.

ENABLE/WAIT LTA is the trigger-linkage function, and is only selectable in the COMBI mode.

-ENABLE LTA The Logic State Analyzer enables triggering of the Logic Timing Analyzer.

-WAIT LTA The triggering of the Logic State Analyzer is enabled by the Logic Timing Analyzer.

NEXT initiates the next step in the sequence.

```
STATES  OCCUR   USEC     MSEC      SEC      -----   -----   -----
```

If DELAY has been selected these softkey functions become available.

STATES The delay is by state clocks.
The clocks activated in the configuration menu or a combination of these clocks can be specified.

OCCUR The delay is by occurances of a specific word.
This word can be the same word as used in the trigger step itself, or word A.
If word B has not been used in the trigger word list, this one can also be used as a occurances delay word in every trigger step.

USEC MSEC SEC
Provide a delay in time.

```
----------------------ON CLOCKS--------------------------
  0      1      2      0+1      0+2      1+2     0+1+2   -----
```

Here you can select the clock(s) related to the earlier selected states delay.
Note that the '+' sign means a logic 'OR'.

```
--------IF WORD---------
  2       2⇒3   2 OR 3    -----     -----     NEXT     -----    -----
```

Gives the possibility to check for 1, or 2 or an immediate follow of two words, combined with the delay function.
If key NEXT is pressed the next trigger step is initiated, and we just have a simple form of delay.

```
-IN--   -AT--
DELAY   DELAY    -----     -----     -----     -----     -----     -----
```

Here you can extend the trigger delay function.
The above trigger word(s), or combination of words can be selected to be found during the delay, or at the end of the delay. Pressing either of these, results in the appropriate soft key text, being entered into the trigger sequence plus the prompt 'THEN STEP'. Following this we must enter the step number to which we require the trigger sequence to brancg to, if the 'IF...THEN' condition is meet. Upon entering entering this step number via the hex pad the soft keys respond with the following:

```
ELSE
STEP      -----     -----     -----     -----     NEXT      -----     -----
```

If the NEXT key is pressed, a new step is generated. In addition the instrument assumes that, if the 'IF...THEN' condition is not fulfilled, the trigger sequence should continue from this new step number. Should we not require this, then use of the 'ELSE STEP' key enables free definition of the step number at which the trigger sequence should continue.

Up to now we completed an example of a rather extended trigger step. Try other trigger functions for your self.

Timing trigger menu

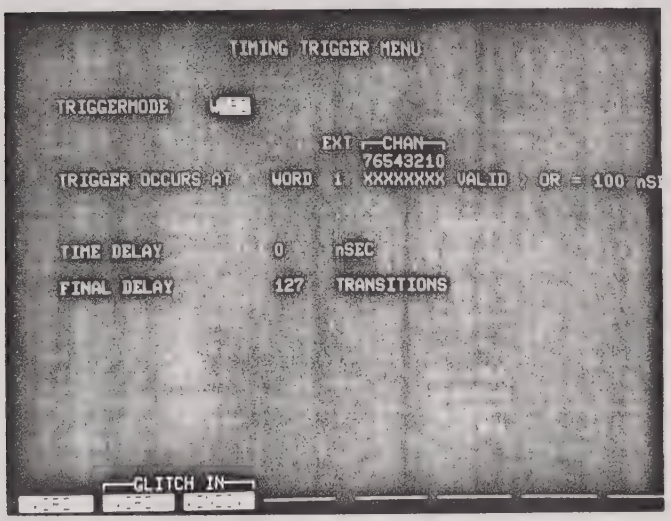


Fig. 4.3 Timing Trigger Menu

The main functions in this menu are, from top to bottom:

TIMING TRIGGER MENU

-TRIGGER MODE

-TRIGGER OCCURS AT

-TIME DELAY

-FINAL DELAY

TRIGGER MODE:

WORD
Triggering occurs at the trigger word.
(When the word trigger word is used in this text we include the external trigger qualifier).

GLITCH IN WORD
Glitch triggering combined with the specified trigger word.

GLITCH IN WINDOW
Glitch triggering within a time window which always starts with the specified trigger word.

TRIGGER OCCURS AT ---

If WORD or CLITCH IN WINDOW has been selected at the above trigger mode, AT or AFTER can be selected here.
The following combinations are possible:

-AT WORD
Triggering occurs when the trigger word has been true for at least the selected valid time.

-AFTER WORD
Triggering occurs at the trailing edge of the trigger word true condition, if this condition has been true for at least the selected valid time.

-AT GLITCH IN WINDOW
Triggering occurs at a glitch which is present in a selected time window.

-AFTER GLITCH IN WINDOW
Triggering occurs at the trailing edge of a time window, if a glitch has been present in that window.

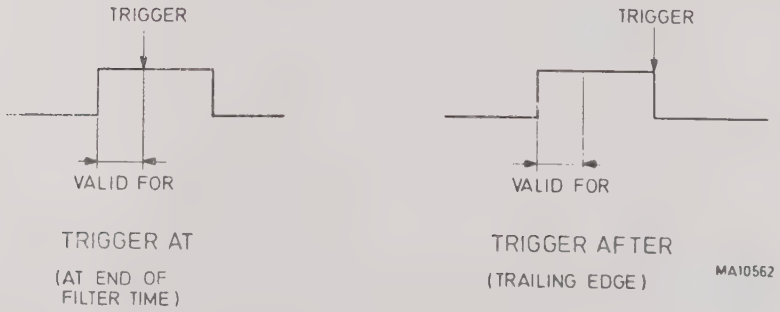


Fig. 4.4 TRIGGER OCCURS AT or AFTER

EXT
Next thing you can select is the external trigger qualifier. This signal can be a 0, 1, or X.

CHAN
The eight bits of the trigger word are displayed here. Each bit (except those bits which have been switched-off in the Configuration menu) can be set to a 0, 1, or X.

VALID ¨ OR =
This is the valid time setting for the trigger word (and the qualifier).
The trigger condition must be true for at least the selected time.
In this way you can suppress erroneously triggering due to parasitic glitches.

If the glitch triggering has been selected, also the 'glitch line' is displayed.
The trigger glitch can be selected on one of the timing channels.
If the glitch trigger has been set on a certain channel, the trigger bit recognizer of that channel is automatically disabled.

VALID ^ OR =
This is the valid time setting for the trigger glitch.
Glitches which are longer than the selected time are neglected.
Note that the capture mode effectively prelongs a glitch shorter than 20ns to 20ns.

The next line shows:
TIME DELAY if you have selected trigger on WORD or GLITCH IN WORD, or WINDOW if you have selected GLITCH IN WINDOW.
The time is selectable via the decimal keys of the hex keyboard (max. approx. 20 mS).

-TIME DELAY
This is the delay between presence of the trigger condition and the start of the final delay.

-WINDOW
This is a time window during which a trigger glitch can be detected.
Triggering occurs if during this time window a glitch of less than the specified length occurs.

The last line shows:
FINAL DELAY
This is the delay which gives pre-, center- or post data with respect to the end of the Time Delay.
The final delay can be set with the softkeys PRE, CENTRE and POST, or can be set to any value between 0 and 255 with the decimal keys of the hex keyboard.

PRE : The memory of the timing analyzer is filled with data present just before the end of the time delay (delay=25).
CENTRE : The memory is filled with data 'centered' before as well as after the end of the time delay (delay=127).
POST : The memory is filled with data appearing just after the end of the time delay (delay=230).

If pre- or post trigger data setting is selected via the softkeys, a default overlap of 25 transitions is used.
Refer to Fig. 4.5.

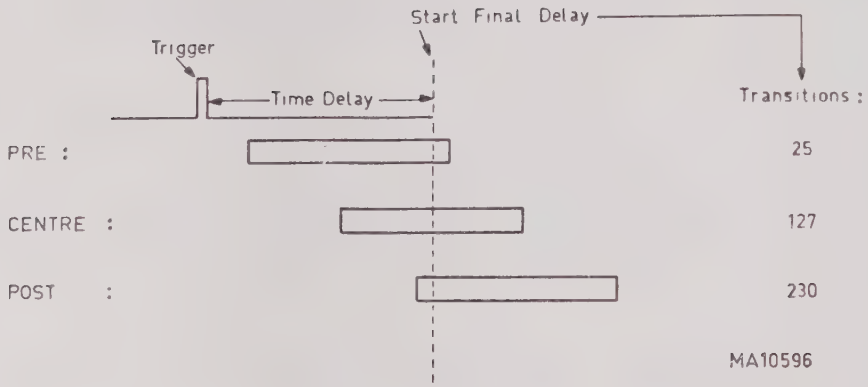


Fig. 4.5 Time Delay and Final Delay

4.1.3 DATA MENU

Press the FULL- and the DATA key in the MENU area.
If you had selected a stored mode before, the data menu will be as it was stored.

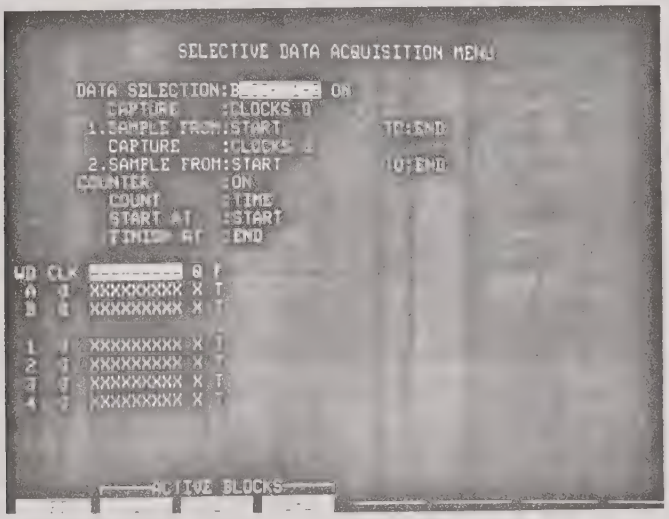


Fig. 4.6 Data Menu

Now the SELECTIVE DATA ACQUISITION MENU is on the display.
This menu has two functions:
1. Selection of data which will be stored in the Analyzer's memory.
2. Enabling of a counter which counts the number of specific samples (word- or clock related), or the time between two selected words.

Both functions may be enabled at the same time.

Note that this menu applies only to the State Analyzer.

The data menu is divided in 3 main fields, from top to bottom:

```
        **SELECTIVE DATA ACQUISITION MENU**
-DATA SELECTION: (BLOCK1)
                 (BLOCK2)

-COUNTER:---

-WORDS LIST
     -
     -
```

DATA SELECTION can be switched on or off.
DATA SELECTION means making a selection of the data to be stored in the Analyzer's memory.

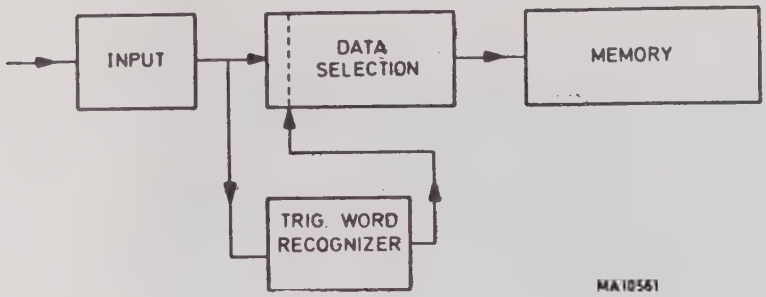


Fig. 4.7 Principal Block Diagram Data Selection

Data selection is very usefull, when collecting certain groups of data from a long programm, e.g. jump routines in a repetitive loop.

Selective data acquisition is only effective in so-called blocks; two different blocks can be defined at the same time.

Four kinds of selective data acquisition are possible:

ONLY CLOCKS
-Only samples on specified clock(s)

WORD AND CLOCKS
-Only words A or B and samples on specified clock(s)

ONLY WORDS
-Only words A or B

WORD A + DELAY
-Only words A followed by a certain numbers of samples on the specified clock(s).
REPEAT This combination may be repeated a number of times (max 255)
ALWAYS The word A +delay capture combination runs continuously up to the end.

Blocks are defined by a START and an END.
The start of a block can be:
-START, this is the start of data acquisition.
-WORD, this can be any of the words of the trigger menu.
-WORD+DELAY, this enables starting of data acquisition, when the delay counter following a specified word is fulfilled.

The end of a block can be:
-END, this is the end of data acquisition, so the final triggering.
END can be used if the block starts with START, or with a WORD .

-NEXT, this is the following event in the trigger sequence.
It can be the next word found, or the fulfilling of the following delay counter. Very usefull for conditional branches.

NEXT can only be selected if the block starts with a WORD.

-WORD, this is a word of the trigger list.
If for start a word has been selected, the number of the end word may not be lower than that of the start word.

-WORD+DELAY, a word can be followed by the delay coupled to that word in the trigger menu.

COUNTER

The counter is a function which can count samples or time between two defined points.
Counting can be specified as:
ONLY CLOCKS, only samples with the specified clock(s) will be counted.
WORDS+CLOCKS, only words A or B with the specified clock(s) will be counted.
ONLY WORDS, only words A or B are counted.
TIME, time measurement

The count result is indicated in the State List display.

The counter is only enabled in a window. This window is defined by a start and an end, and can be set as follows:

START AT can be specified by START, or by a word of the trigger list.
START is the start moment of data acquisition
WORD is one of the words of the trigger list.
WORD+DELAY is one of the words of the trigger list with the delay coupled to that word.
FINISH AT can be specified by END, NEXT, or WORD.
END is the end of data acquisition (final triggering)
NEXT is the next word in the list.
WORD is one of the words of the trigger list.
WORD+DELAY is one of the words of the trigger list with the delay coupled to that word.

4.1.4 COMPARE MENU

Press the FULL- and the COMPARE key in the MENU area.

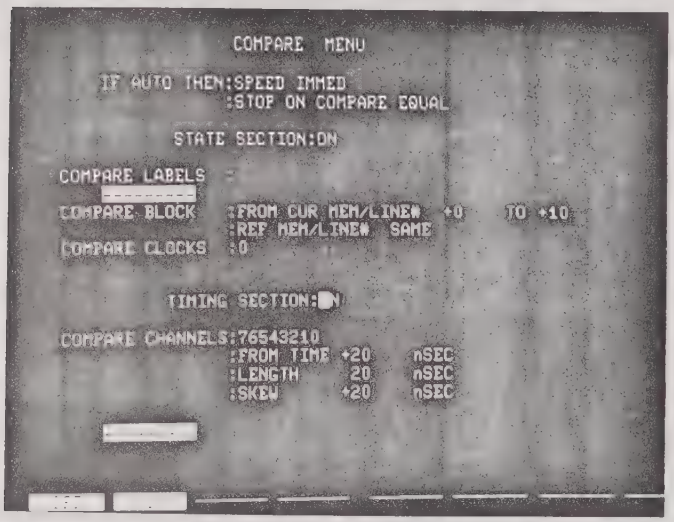


Fig. 4.8 Compare Menu

Now the Compare menu is on the display; we have now the possibility to compare two blocks of data.
One block is current data (stored in the acquisition memory), the other block is data in the reference memory of the analyzer.

Comparison can be done for data in the state section as well for data in the timing section, and can be done in both the manual- and the auto start mode.
Note that also comparison is possible in the COMBI- and SYNC modes.

The main functions in the compare menu are:

COMPARE MENU

-IF AUTO THEN :--

-STATE SECTION :--

-TIMING SECTION:--

IF AUTO THEN :
The auto restart display time is adjustable here. This is the time between final triggering, and the start of the next data acquisition. You can adjust this time between 1...9 sec, or IMMEDiate.
With Immed the maximum compare frequency rate is obtained.

Note that this setting is not only applicable in the Compare mode, but also in the non-compare auto mode.

In the Auto Compare mode the following functions are selectable:
-STOP ON COMPARE EQUAL
Data acquisition and comparison continue until an equal compare has been found.

-STOP ON COMPARE NOT EQUAL
Data acquisition and comparison continue until an unequal compare has been found.

-COUNT FAILURES AND SUCCESSES
Data acquisition and comparison continue until you press the STOP key. In the meantime the numbers of FAILURES (unequal-comparisons) and SUCCESSES (equal comparisons) are counted.
The results are presented in the data display.

STATE SECTION :
This function can be switched on or off.

COMPARE LABELS:
Gives the possibility to select which labels, must be compared.
Selection of the labels is done with the soft keys.

COMPARE BLOCK:
With this function you can define the blocks in the current- and reference memory which must be compared.
Note that thanks to the versatile compare features, data blocks in different areas of both memories can be compared, refer to Fig. 3.12.
In this case a line number, or a word number limit specification is required.

Current memory:
The start can be defined with :
-MEM/LINE# this may be any number between -1023 and +1023.
-TOP this is the beginning of the memory.
-WORD this is a word of the trigger list.

The end can be defined with :
-MEM/LINE# this may be any number between -1023 and +1023.
-BOTTOM this is the end of the memory.
-WORD this is a word of the trigger list. The word number must be higher than that of the word defining the start of the block.

In the simplest form the current memory block could be defined as: from TOP to BOTTOM.
The block length of the reference memory is always the same as the length of the current memory block.

Depending on the selected current memory limits, the reference memory limits are generally specified as SAME. In case VAR has been selected, a mem line # in the reference memory can be specified as start of the reference memory block.

COMPARE CLOCKS
Also it is possible to select samples for comparison by their clocks.

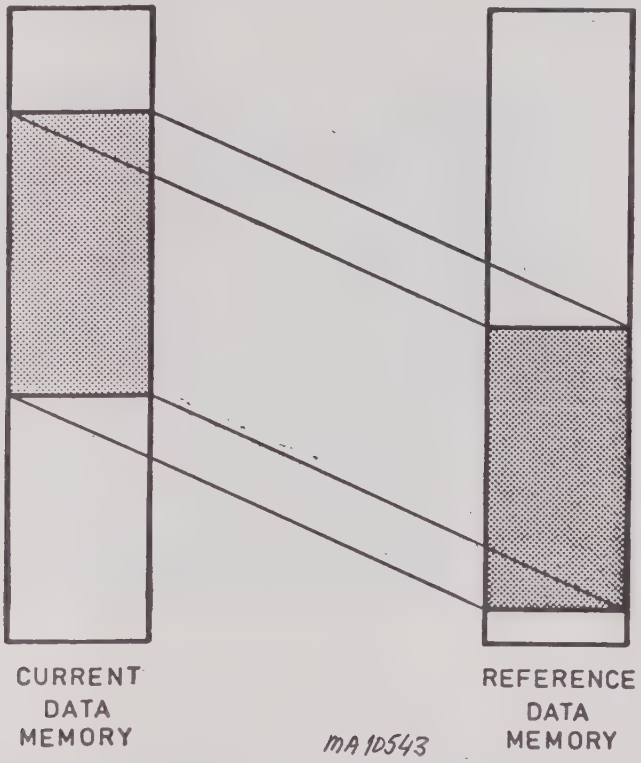


Fig. 4.9 Comparison of Shifted Memory Blocks

TIMING SECTION :
Can be switched on or off.

COMPARE CHANNELS
Each channel can be switched on or off for comparison.

:FROM TIME
This is the time between the beginning of the acquisition memory, and the beginning of the block in that memory that must be compared.

:LENGTH
Length of the timing block to be compared.

:SKEW
This is the maximum time the timing block may be shifted, (positive - as well as negative) with respect to the timing block in the reference memory.

The analyzer automatically searches within the skew range for equal timing blocks.

4.1.5 OPTIONS MENU

Press the OPTION key in the MENU area.

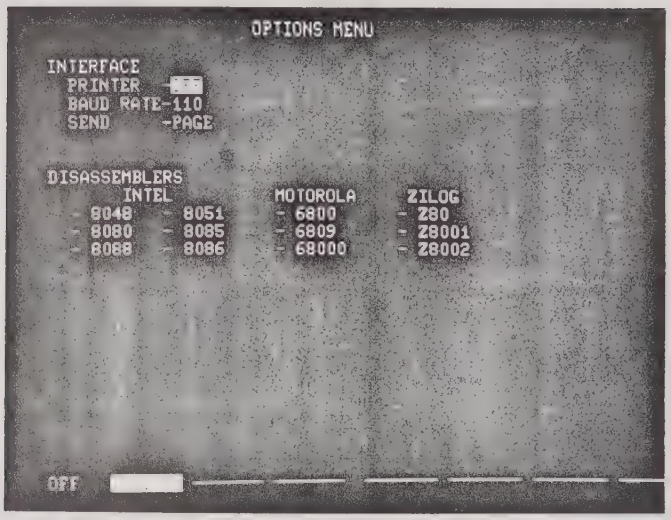


Fig. 4.10 Options Menu

Now the options menu is on the display.

The main sections of this menu are:

OPTIONS MENU

INTERFACE:

DISASSEMBLERS:

The interface can be a:
-Printer interface
-RS232C duplex interface.
-IEEE 488 bus interface.

Printer:
The printer must be provided with an RS232C interface. The Baud-rate of the Logic Analyzer I/O can be adjusted at the standard values from 110 to 9600.

The following print-commands are selectable:

DISPLAY PAGE
The printer prints a copy of the analyzer's display.

ALL DATA
All data in the acquisition memory are send to the printer.

DATA+MENUS
The full instrument setting and the data in the acquisition memory are sent to the printer.

ALL MENUS
The full instrument settings are sent to the printer.

-The print action is started by pressing the I/O CONTROL PRINT key.
The print action is halted by pressing this key again.

4.2 CONDENSED MENUS

GENERAL INFORMATION

A condensed menu is meant as a "quick reference guide" when you are looking at a data display, and contains the most important information of the corresponding full menu.
There is a condensed menu for each available full menu (except the option menu).
A condensed menu is displayed in the upper six display lines, above the data.
Generally settings present in the condensed menu can be changed by pressing the Cursor in Heading key, positioning the cursor, and entering the desired setting.

The menu name is always in the centre of the top line.
The top left corner locates the operator warnings, such as:
INVALID KEY, OVERRANGE, etc.
The right top corner is reserved for the acquisition message.
Direct after start of acquisition the message: ACQUISITION STARTED is given.
In the following descriptions is presumed that one of the keys LIST, GRAPH, or TIMING has been depressed.

CONDENSED CONFIGURATION MENU

Press the CONFIG key.

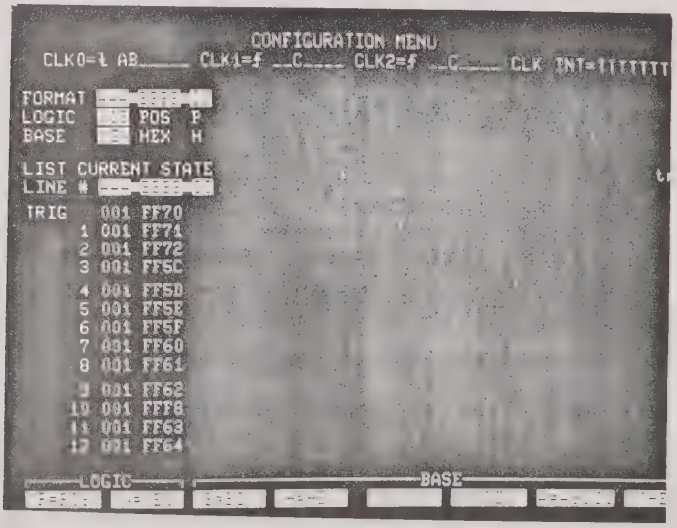


Fig. 4.11 Condensed Configuration Menu

The top line of the condensed menu shows which clocks have been activated, and the corresponding channel labels.
The three remaining lines show the display format, -logic and -base of the input data.

CONDENSED TRIGGER MENU

Press the TRIG key.
Remember that in the Combi mode pressing this key, consecutively displays the State-, and the Timing trigger menu.

Condensed state trigger menu

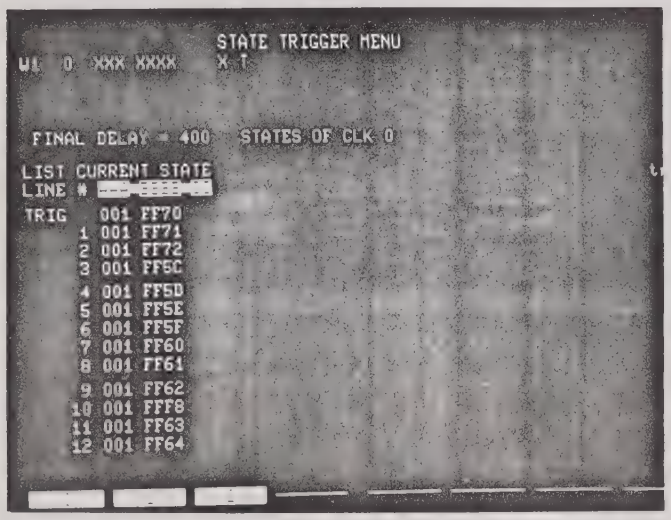


Fig. 4.12 Condensed State Trigger Menu

The triggerwords are displayed with active clock edge, and triggerword false or true indications.
Maximum four triggerwords are displayed.
If you selected more than four triggerwords in the full triggermenu, only the last four words are displayed here.
With the cursor up and down keys the remaining trigger words can be scrolled visible.
If a final delay (this is the delay after the last trigger word) has been selected, it is also displayed here.

Condensed timing trigger menu

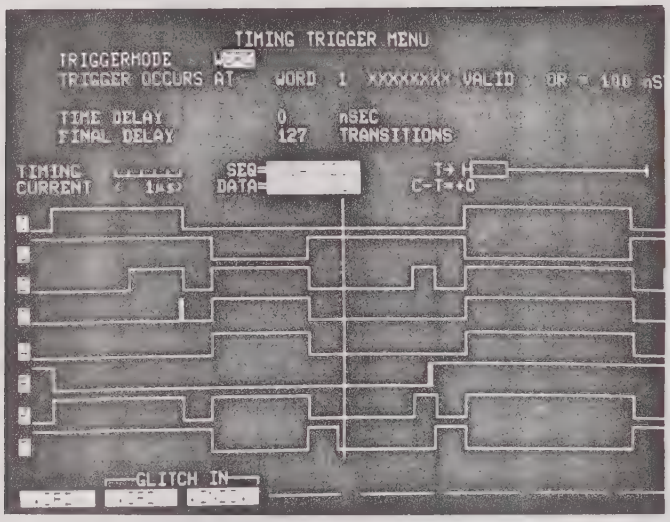


Fig. 4.13 Condensed Timing Trigger Menu

As an exception the condensed timing trigger menu shows all the timing trigger parameters.
The first line shows the Trigger Mode.
The second line shows the Trigger Qualifier, the Trigger Word and the minimal time (Valid For) during which the trigger condition must be true.
The third line (if present) shows the active channel glitch detection, with the selected valid time.
The next line shows the Time Delay, or the Time Window.
The last line shows the Final Delay.

CONDENSED DATA MENU

Press the DATA key.

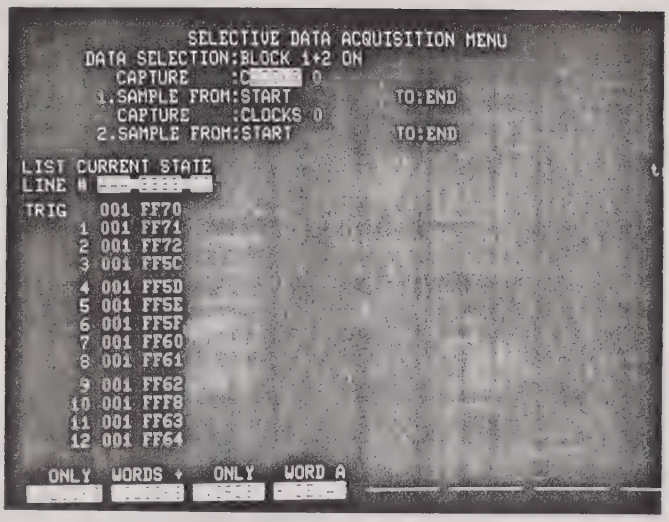


Fig. 4.14 Condensed Data Acquisition Menu

If data selection was enabled, the related block limits and captured samples are given here, in the same lay-out as in the full menu.
The counter setting is not shown in the condensed data selection menu.

CONDENSED COMPARE MENU

Press the COMP key.

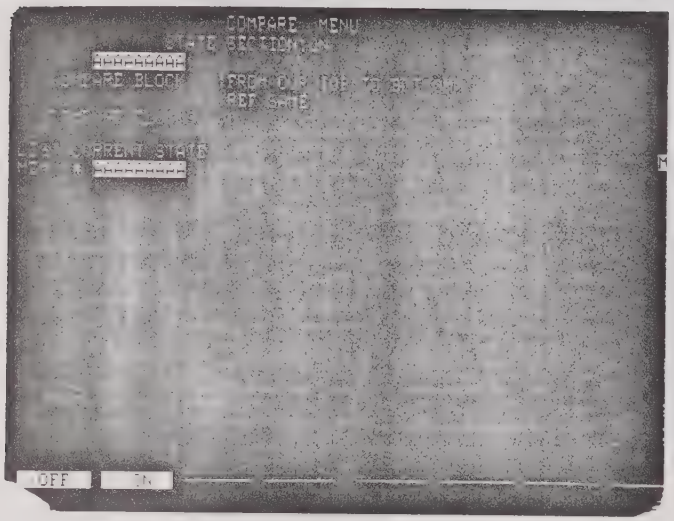


Fig. 4.15 Condensed Compare Menu

Condensed state compare menu.

This menu shows:
State section: ON
The block limits in the current memory as well as in the reference memory.
The clocks to be compared.

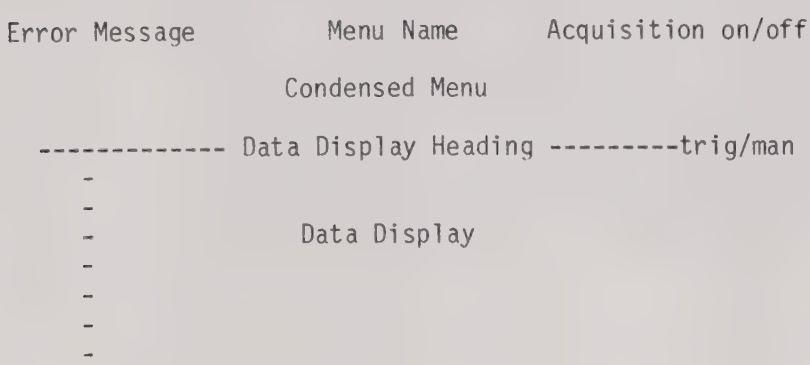
5. DATA DISPLAYS

There are two groups of data displays:
List display
Timing display (only with versions PM 3551/30/70)

The List display represents data from the Logic State Analyzer.
The Timing display shows data from the Logic Timing Analyzer.

Each data display is accompanied with a condensed menu, located at the top of the data display. For description of the condensed menus refer to chapter 4.2.

The display is divided in the following sections, from top to bottom:



The menu name is always in the centre of the top line.
The top left corner locates the error messages, such as:
INVALID KEY, OVERRANGE, etc.
The right top corner is reserved for the acquisition message.
Direct after start of acquisition the message: ACQUISITION STARTED is given.

If the CURSOR IN HEADING key has been depressed, settings in the menu can be changed.
If the CURSOR IN DATA FIELD key has been depressed, control is given over the displayed data.

A specific data display is always selected by pressing the relevant key in the DATA DISPLAY area.

The source for the data display can be selected with the keys:
CURRENT which displays the data from the current memory
REF which displays the data from the reference memory
COMPARE which displays data from the current memory, and compares it with the reference memory data.
Inequalities are indicated by reversed video presentation in the LIST, and underling in the TIME display. There is no GRAPH compare display.

In the following description of the displays, keys CURSOR IN DATA FIELD and CURRENT have been depressed.

5.1 LIST

Press the LIST key.

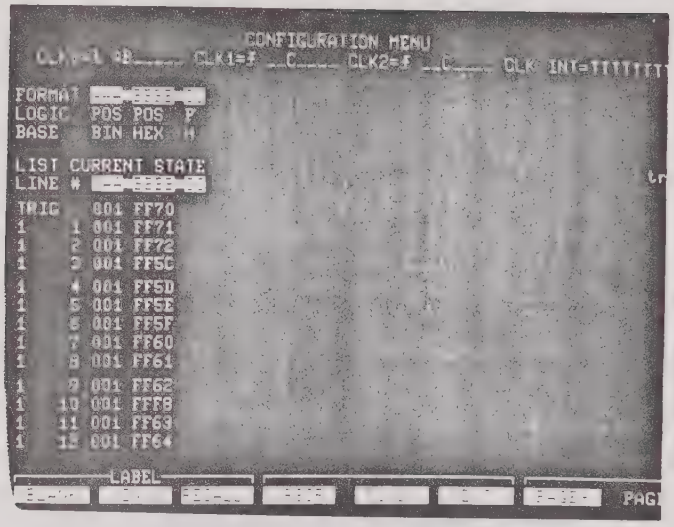


Fig. 5.1 Data List Display

List heading

The heading of the list display contains the following information:

LIST CURRENT STATE
MEM OR LIN NO Selected Labels

LIST : The name of the display
CURRENT,
REFERENCE or
COMPARE : The source of the displayed data.
STATE : Means State list.
OLD : Is shown if settings have been changed after acquisition.

MEM or LIN NO : Memory address number or line number.
This is the sequential numbering of the samples in the memory.
MEM NO is used if the trigger word is not in the memory. E.g. final delay greater than 1023 samples.

LIN NO indicates that the trigger word is in the memory and gives the relation between the sample number and the trigger word.
The trigger word itself has number 0, but is indicated with TRIG.
Forgoing trigger words (arm words) are indicated as WRD1, WRD2 etc.
Samples before the trigger word have a '-' number; samples after the trigger word have a '+' number.

Label line — This line shows the labels as selected in the configuration menu.
With the cursor in the heading, labels can be deleted or recalled, or the value can be inverted (refer to the LABEL soft keys). See below.

List display

Data is represented under the selected labels, according to the selected base, polarity, etc.
The list is generally 13 lines long; the top line is the data cursor line.
The data cursor line is used as a reference between the list display and the timing display in the sync mode, and the graph display, in which the data cursor is a vertical solid line.
If no data are present in the memory, the list display is empty.

List set-up

The data list set-up is depending on the relation between clocks and labels as selected in the configuration menu.

If each label is sampled with a specific clock, the succesive clock number samples will be displayed next to each other (parallel display). Refer to the following two examples:

CONFIG. MENU	LIST DISPLAY		
1)			
CL 0 label A	A	B	C
CL 1 label B	CL 0	CL 1	CL 2
CL 2 label C	-	-	-
	-	-	-
	-	-	-
2)			
CL 0 label C	A	B	C
CL 1 label B	CL 2	CL 1	CL 0
CL 2 label A	-	-	-
	-	-	-
	-	-	-

Note that a clock 0 sample always starts a new line of the table.
A clock 1 sample is positioned on the same line when it follows the clock 0 sample. In the same way a clock 2 sample is put on the same line when it follows a clock 1 or a clock 0 sample.
If no clock 0 sample is present, a clock 1 sample can start a new line. If no clock 0 and no clock 1 samples are present, a clock 2 sample starts a new line.
On the other hand, channels sampled by different clocks but with the same label, will be displayed under the same label without any further clock indication (serial display).

As there is no direct time relation between two successive lines of the data list, there is also no time relation between samples with different clocks on the same line. However the minimal time here is longer than one clock cycle.

Softkey functions

With the cursor in the DATA FIELD the following softkeys are shown:

```
----- LABEL -------   ------------------   -----------
BLANK  INV.  RECALL   CURSOR  FIND  NEXT   PAGE+  PAGE-
```

The LABEL functions control the presentation of the channels or groups as shown in the List heading.
Pressing the BLANK key blanks the related column of data, resulting in information being deleted from the screen and replaced by a column of points.
The label-character is replaced by a dash.
With the RECALL key the column of data can be recalled.
The INV. softkey inverts the value in the related column; the label is now shown as a undercase character. If this key is pressed again the non-inverted values come back. Also if RECALL is pressed on an inverted column, the non-inverted values come back.

The next group: CURSOR, FIND, NEXT, PAGE+, and PAGE- controls the data cursor as a viewing-aid over the memory. Soft scroll of the list is possible with the CURSOR SCROLL keys.
The top line of the displayed data list is the cursor word.

Pressing the CURSOR softkey enables entering of a mem line number. This number can be preceded with a '+' or '-' sign. The number must be given via the hex-pad. Pressing the ENTER softkey adopts the new cursor value on the display. If the CLEAR softkey is pressed the former value holds on.

On pressing the FIND key the following soft key functions are shown:

```
                                  MEM
----   ----   ----   ----        CONT    TRIG    WORD    ----
```

Pressing FIND enables the entry of a user defined word via the hex pad, or the entry of one of the trigger words via the softkeys.
On pressing the softkey ENTER the display commences at the first occurance of the required word in the memory.

With the PAGE+ and PAGE- softkeys the cursor can be paged through the memory (this is + or - 13 lines respectively).

Cursor functions

SCROLL UP, SCROLL DOWN These functions feature soft scroll of the data list.

SHIFT ← and → control the set cursor position.

STATE COMPARE

For comparison of data lists the following preparations are required:
-Store the reference data in the reference memory. This can be done by pressing the STORE DATA key by which data in the current memory is copied into the reference memory, or by storing external data via the I/O interface.
-Set the compare conditions in the state compare menu.

After pressing the DATA DISPLAY COMPARE key, and pressing the SINGLE START key, the result of the comparison is displayed.

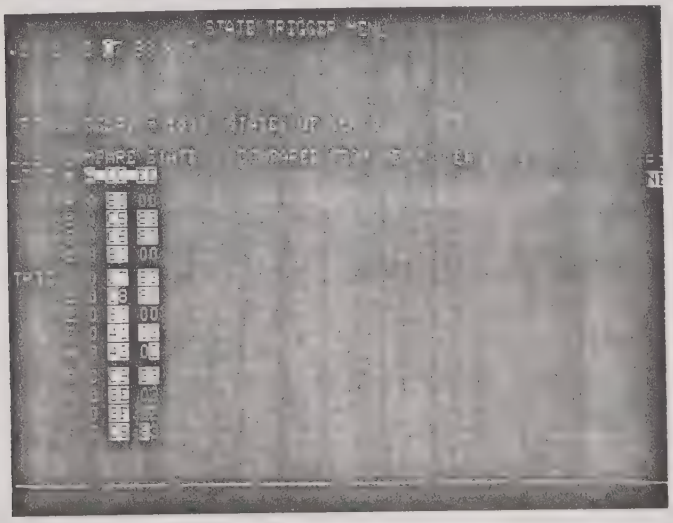


Fig. 5.2 List display in the compare mode.

COMP is indicated in the list heading and the compare result EQ or NEQ is displayed.
Not-equal data will be displayed in reverse video.

State compare is also possible in the auto mode, the total of equal comparisons and of the not-equal comparisons is then also displayed.

5.3 TIMING DISPLAY

Press the TIMING key.

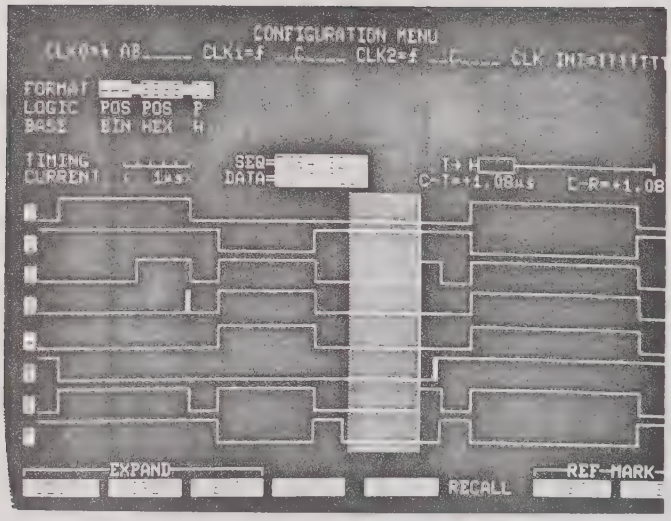


Fig. 5.3 Timing Display

Heading

The heading of the timing display contains the following information, from left to right:

TIMING : The name of the display
CURRENT: The source of the data.

Time scale, gives a quick impression of the value of the time axis.

SEQ=7654 3210
DATA=0100 0010

SEQ is the sequence of the channels as displayed on the screen, from bottom upwards.
DATA is the corresponding contents of the data cursor.
Blanked channels and their data cursor contents are shown in normal video.

This is the Display-in-Memory symbol.
The whole length between the vertical end lines of this symbol, represents the whole memory of the Logic Timing Analyzer.
The rectangle on the line represents that section of the memory which is displayed on the screen.

The T with the arrow shows whether the trigger word is in the memory, or not.
The arrow pointing to the right means that the trigger word is in the memory.
The arrow pointing to the left means that the trigger word is not in the memory.

C-T= C-R= C-E=

C-T is the time between the cursor and the trigger word.

C-R is the time between the cursor and the reference marker (this is only shown if the reference marker has been set).

C-E is the time between the cursor and the end of the memory in case of manual triggering (STOP).

Waveform-display

The display shows the waveforms of the input channels as captured in the memory.
If no pulses are present on a channel, the logic level of that channel is indicated by the level of the line with respect to the channel number at the left hand side.
The solid vertical line is the data cursor; its contents is given after DATA in the heading. This cursor is used as a viewing-aid, and can be moved with the SHIFT ⇐⇒ keys.
The dotted vertical line is the trigger word.

Cursor- and trigger words contents.
Note that the contents of the data cursor, or of the trigger word refers to the pulses which are located directly at the right-hand side of these lines. Refer to Fig. 5.4.

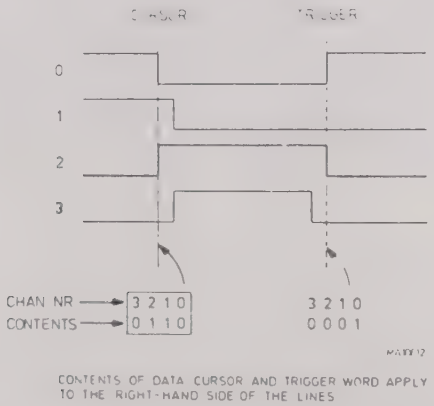


Fig. 5.4 Cursor- and Trigger Contents.

Softkey functions

The following soft key labels are shown:

```
------EXPAND------                                  -REF- MARK-
BEST   MORE   LESS   SEQ   BLANK   RECALL          SET   CLEAR
```

The EXPAND functions control the time axis of the timing diagram:

-BEST shows the timing diagram just overlapping the display. If BEST has been choosen and you press LESS the waveform limit(s) will lay before the end of the display.
-MORE stretches the timing diagram, with expansion around the cursor position.
-LESS compresses the timing diagram (around the cursor position)
Look at the Display-in-Memory symbol if you try these functions.

SEQ controls the sequence of the timing channels on the display.
After pressing this key, the functions DEFAULT and ENTER appear.
Pressing DEFAULT forces the default sequence of the timing channels on the display.
Instead of DEFAULT, the required sequence can be entered via the HEX pad keys 0--7.
The same channel can be positioned more than one time on the display.
After setting of the required sequence, press key ENTER. The original soft key functions reappear.

BLANK and RECALL functions work together, and control the number of the channels on the display. The blanked channels can be recalled with the RECALL key.

The REF- MARK function controls the reference marker with the SET and CLEAR softkeys.
This marker can be used for time measurement between two points on the timing diagram. If the marker is set, the C-R= formulae appears in the heading.
If key SET is depressed a reference marker appears on the screen. The default position of this marker is on the cursor.
When activating the SHIFT <=> keys the cursor is shifted over the diagram, trailing a half-tone veil. The C-R= formulae indicates the time between the veil limits. The veil limits need not be necessairely on the screen.

Cursor functions

SCROLL
If one or more channels on the display has been blanked, the Scroll function can be activated.
This function features smooth vertical displacement of the timing waveforms.
During scroll blanked channels appear on the screen, and others are disappearing, independent of the selected channel sequence.

SHIFT ⇐⇒
The SHIFT ⇐⇒ keys feature horizontal movement of the data cursor. In the first instance the data cursor moves through the waveforms on the display. As soon as the end of the display has been reached, the data cursor sticks to his position, and the waveforms start moving thus showing another part of the memory. Look also at the Display-in-Memory symbol in the display heading.

TIMING COMPARE

For comparison of timing diagrams the following preparations are required:

-Store the reference data in the reference memory. This can be done by pressing the STORE DATA key by which data in the current memory is copied into the reference memory, or by storing external data via the I/O interface.

-Set the compare conditions in the timing compare menu.

After pressing the DATA COMPARE key, and pressing the SINGLE START key, the result of the comparison is displayed.

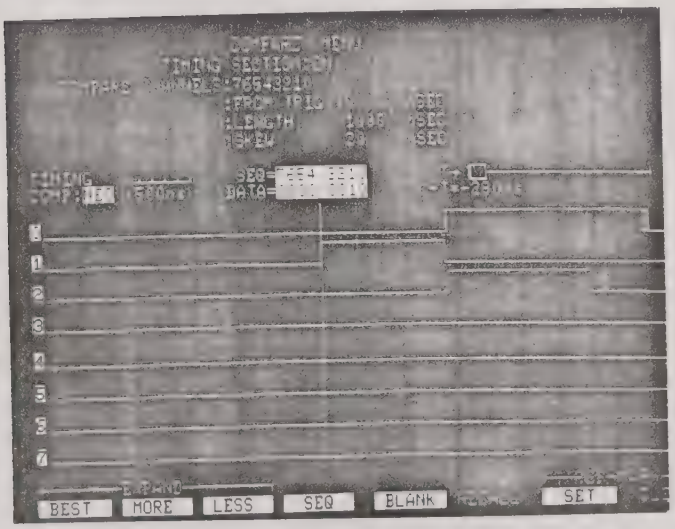


Fig. 5.5 Timing diagram compare mode

COMP is indicated in the list heading and the compare result EQ or NEQ is displayed.
Not-equal timing data will be indicated by dotted lines, and the relative channel numbers are blinking.

Timing compare is also possible in the auto mode, the total of equal comparisons and of the not-equal comparisons is then also displayed.

SYNC MODE

In the sync mode, the timing analyzer is triggered by the ENABLE LTA statement in the trigger sequence of the state analyzer.

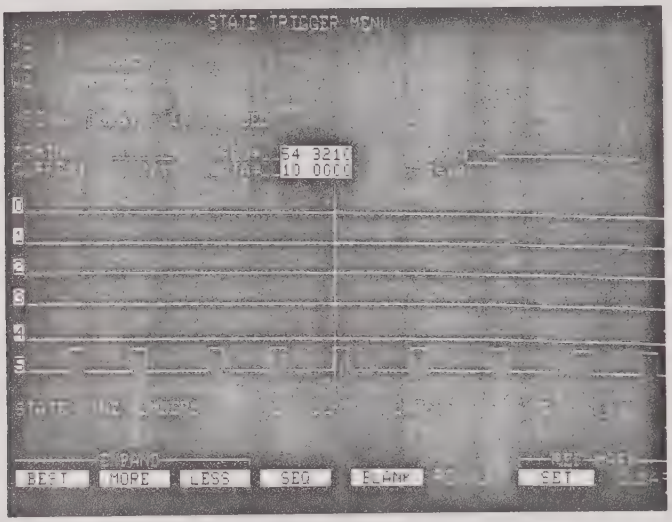


Fig. 5.6 Timing diagram sync mode

As explained in the description of the sync mode, there are now six timing channels max.
On the display under the timing diagram, a marker line, and a state line number line are present.

The markers represent the corresponding state samples. In the state number line the position of the cursor is given with respect to the state samples. The clock sources of the state samples is given between brackets.

NO SYNC POSSIBLE

This message appears under the sync timing display if the instrument cannot find the proper coupling between the state list and the timing diagram. This is when the word belonging to the ENABLE LTA statement in the trigger list is not present in the state analyzer memory.
In addition, with software release 51-01, NO SYNC POSSIBLE is displayed if an IF statement is present in the trigger list.

6. CONNECTION

```
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
x   It is recommended to connect the Logic Analyzer, having the          x
x Configuration menu on the display, because there is strong relation-  x
x    ship between this display and the practical measuring set-up.      x
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

6. CONNECTION OF THE INPUTS

All data, clock, and qualifier input signals from the System under test are applied via (8-channel) Pods.
The Pod identification as indicated on the rear panel of the Analyzer corresponds to the Pod labelling on the display.
Note that the ground input of each Pod must be connected to a good circuit ground in the Sytem under test.
The Pod plugs can be mechanically locked in the connectors at the rear panel of the Analyzer.

Applicable Pods:
State Analyzer : PM 8821
Timing Analyzer: PM 8825

Before you proceed check all connections you made.

Data input

Data input uses Pods #0...#6 of the State Analyzer section, and Pod #0T of the Timing Analyzer.

Clock inputs

-State Analyzer
The clock signals must be applied via Pod #Q as in following table:

Clock	Pod input nr.
CLK0	7
CLK1	6
CLK2	5

-The Timing Analyzer has no external clock input.

Clock qualifier inputs

-State analyzer
The qualifier signals (max. 4) must be applied via Pod #Q, as in following table:

Qualifier	Pod input nr.
Q0	4
Q1	3
Q2	2
Q3	1

Independent of the number of clocks and/or qualifiers used, 3 channels of Pod#Q (input nrs. 0,1 and 2) are on the display.
Input 0 remains always available as a data channel.
Inputs 1 and 2 become available as data-channels when Q3 respectively Q2 are not in use (set as don't care).

-The Timing Analyzer has no external clock qualifier input.

WHAT ELSE TO CONNECT?
Except above inputs some more connections can be made.

Logic State Analyzer
-Input:
TRIG IN can be used as an external trigger source (e.g. from the system under test),
as well as trigger qualifier.

THRESHOLD PM 8800/8810 ?

-Outputs:
MATCH OUT delivers an /// // signal at detection of the trigger word(s), depending on the 'Trigger Output At:' selection in the trigger menu.

RUN OUT delivers an /// /// signal during data acquisition i.e. between start and final triggering of the Logic State Analyzer.

Logic Timing Analyzer
-Input:
TRIG IN can be used as an external trigger source (e.g. from the system under test),
as well as trigger qualifier.
Hoe threshold ed?
-Output:
MATCH OUT delivers an /// /// signal at detection of the trigger word.
met of zonder delay, qualifier?

Video Interface Unit
Output:
COMP VIDEO delivers a video signal to drive an additional video display, or a video printer.

7. USER MESSAGE LIST

Each time data acquisition is started, the message ACQUIS. STARTED appears in the right-hand top corner of the display.
After triggering, the message TRIG appears in the data-heading. After manual triggering (key STOP), the message MAN is shown.

Note that, if acquisition is started and no final trigger is found, other menus or displays can be choosen, but settings cannot be changed. If in this case settings have to be changed first press the STOP key.

User messages flash in the left top corner of the display in case of incorrect keyboard input or manipulation.
A message marked with an *) in this list is an informative message rather than an error message.
The following messages are possible:

BEGIN OF MEMORY: In the timing diagram; the cursor position has been set at the begin of the memory.

CLOCK EMPTY : No samples taken by the specified clock source present in the memory, or a clock has been activated without any label.

COMPARE BUSY : Internal compare program is running. *)

CURSOR ADJUSTED: In the timing diagram; the cursor has been shifted to the valid data area.

CURSOR TRIGWORD: Trigger word has been copied from the cursor contents. *)

END OF MEMORY : In the timing diagram; the cursor position has been shifted to the end of the memory.

ENTER 0--7 : In the timing diagram; enter a channel number. *)

ENTER LABEL NR : Now a label must be entered. *)

ERROR IN VALUE : In configuration menu; threshold voltage not entered properly (e.g. 5..)

FRACTION ERROR : The fraction does not correspond to the value mentionned in the specification or the prompting messages.

FROM NOT IN CUR: The 'from' limit is not in the current memory.

FROM NOT IN REF: The 'from' limit is not present in the reference memory.

KEY IGNORED : This was not the correct key.

KEY NOT ACTIVE : Not active softkey pressed.

KEY NOT VALID : Wrong key pressed.

LABEL EMPTY : An attempt was made to copy a trigger word from an empty label line in the data list.

LIMITED SPACE : Screen overflow may occur if e.g. a hex word is converted to ASCII.

MENUS CONFLICT : Settings in various menus do not correspond.

NO ASCII INPUT : An ASCII word can not be entered.

NO COMMON CHNLS: No common channels for comparison.

NO COMMON AREA : No common data area for comparison.

NO CURRENT DATA: Reference store not possible due to missing data.

NO DATA PRESENT: In the timing diagram; no data present in the memory.

NO END : In State trigger menu; no END statement at end of trigger sequence (true) list.

NO FREE LABELS : All label indications in use.

NO REF. DATA : No reference data available for comparison.

NO ROLL DOWN : In the timing diagram; end of downwards soft scroll, or all eight channels on the display.

NO ROLL UP : In the timing diagram; end of upwards soft scroll, or all eight channels on the display.

NO STATE LABELS: In configuration menu; if no labels have been selected for the state analyzer.

NO SYNC POSSIBLE: This message appears under the SYNC MODE timing display, if the trigger word belonging to the ENABLE LTA statement in the trigger list is not present in the memory of the state analyzer. *)
With software release 51-01, this message is also shown if an IF statement is present in the trigger list.

NO TIME LABELS : In configuration menu; if no labels have been selected for the timing analyzer.

NOT AVAILABLE : Option or function not installed.

NOT BOTH TRIG'D: No normal triggering in current- and reference memory.

NOT FOUND : Memory word or sample as questionned is not present in the memory.

NOT SELECTED : In the timing diagram; a channel is selected which has been switched-off in the configuration menu.

OVERRANGE : Attempts are made to enter a too high number or value.

ONLY 20nS STEPS: In the timing diagram; time resolution is 20nSec.

P Q54321 OUT : The indicated Pod(s) have not been connected at the rear of the Logic Analyzer.

PRESS ENTER : Press the ENTER softkey to enter the new sequence. *)

REF.DATA STORED: Confirms that the reference memory just has been filled with data from the current memory. *)

SCREEN OVERFLOW: A line (e.g. FORMAT) is too long. Change over to hex values.

SEARCHING : The instrument is searching for a specific sample.

SELECT SECTION : The DATA DISPLAY COMPARE function has been selected, without previous activation of the compare function.

SEQ DEFAULT : In the timing diagram; the channel sequence has been changed to default, after changes of settings in the configuration-, or in the trigger menu.

SETTING INVALID: The instrument setting was not correct when you switched off the mains voltage earlier.

SPLIT LABEL : In configuration menu; in case of incorrect setting of the labels.
Equal label arrangement for different clocks is allowed.
'Broken' label arrangement for one clock is not allowed.
Refer to the examples in Fig. 7.1.

STEP INCOMPLETE: In State trigger menu; step not complete.

'TO' NOT IN CUR: The 'to' limit is not in the current memory.

'TO' NOT IN REF: The 'to' limit is not in the reference memory.

UNDEFINED STEP : In State trigger menu; jump in trigger sequence list to an undefined step.

USE DECIMAL KEY: In configuration menu; when setting the threshold voltages do not use the hex keys.

USE SOFTKEY : Press a softkey

WORD LABELLING : With complicated labels this may cost some time. *)

WORD NOT IN CUR: That word is not in the current memory.

WORD NOT IN REF: That word is not in the reference memory.

```
CLKO AAA BBBBBBBB CCCCCCCC DDDDDDDD EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGG
CLK1 AAA BBBBBBBB CCCCCCCC DDDDDDDD EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGG
```

Above is allowed; same labels for more than one clock.
Gives just SPLIT LABEL warning.
Displays a data list without clock reference.

```
                V
CLKO AAA BBBBBBBA CCCCCCCC DDDDDDDD EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGG
```

or,

```
CKLO AAA AAAAAAAA BBBBBBBB CCCCCCCC EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGGG
CKL1 AAA AAA---AA BBBBBBBB CCCCCCCC EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGGG
```

Above is not allowed; label A cannot be grouped.
Gives SPLIT LABEL operation lock.

Fig. 7.1. Some split-label examples

8. OPERATION

8.1 GENERAL

In this chapter we discuss operation hints, clarified with some examples.

The following subjects will be discussed.
-Triggering
-Selective data acquisition
-Compare mode
-Combi mode
-Synced mode

8.2 TRIGGERING

General information

Why Triggering?
Triggering gives you all means to obtain that section of a program you just wanted in the analyzer's memory.

Your tools are:
-Up to 8 selectable triggerwords
-Various delays or counters (on samples, occurances, or time)
-Sophisticated IF/THEN ELSE trigger menu composition language

There are two main possibilities of triggering:
1. Trigger on sequence true
2. Trigger on sequence break

In the following some details on the trigger sequence set up will be discussed.

TRIGGER SEQUENCE DETAILS

The trigger menu is built-up of a number of sequential steps.
The next step is initiated when you press softkey NEXT.
The last step is always an END.

FIND WORD 1
This means that triggerword 1 must be present in the input stream before the analyzer proceeds to the next step in the sequence.

FIND WORD 1 ¨ 2
As above, but the next sample following word 1 must be word 2, (no matter which clock).

FIND WORD 1 OR 2
As above, but word 1 or word 2 must be present.
The OR-structure can be extended by a conditional jump to another step in the list.

E.g.:
FIND WORD 1 OR 2
IF WORD 1 THEN STEP 4 ELSE STEP 5
means that if word 1 is found, action is transferred to step 4, and if word 2 is found the next step will be 5.
The ELSE STEP statement may be omitted.

IF WORD 1, or 1→2, or 1 OR 2
This structure is always followed by one of the delay statements:
IN DELAY or,
AT DELAY

After a FIND WORD statement a DELAY can be added.
This can be by:
-States : the delay counter counts the specified number of the required state clocks.
-Occurances: the delay counter counts a specified number of occurances of a specified word.
-Time : a specified time delay is used.

The use of an IF WORD statement after a delay has been set enables conditional branches of the trigger sequence on the following conditions.

In delay: The word is to be found before the delay is finished.

At delay: The word is to be found on the sample which immediately follows the end of the delay count.

Specifying either IN or AT DELAY results in the generation of THEN STEP...ELSE STEP.
So enabling the entry of the step to which trigger control should be transferred.

Delay on samples means that every sample no matter which clock, counts down the delay by one.
Delay on occurances means that every selective.
Delay on time speaks for itself.

FIND WORD 1 DELAY 1000 SAMPLES
FIND WORD 2
This means that after finding word 1 in the input stream, a delay of 1000 samples must pass, before the analyzer looks for word 2.

8.3 SELECTIVE DATA ACQUISITION

FROM WORD X (+delay value) TO WORD Y (+delay value)
Words X and Y are words which have been registered in the trigger sequence list.
Also the facultative delay values are in the trigger sequence list mentionned adjacent to the triggerwords.

If a certain block is present many times in the input stream, the blocks are 'glued' together in the analyzer memory.

For words X and Y can be used triggerwords 1---7 as registered in the trigger sequence list.

8.4 COMPARE MODE

GENERAL
In the compare mode, data in the acquisition memory is compared with data in the reference memory.
Both the state analyzer as well as the timing analyzer have a compare mode, and have their own reference memory.
After comparison unequal data are accented in the data displays.
The reference memories can be filled with data by:
-Copying data from the acquisition memory, or
-Externally supplied data (via the I/O interface).
Comparison of data can be done in the single shot mode, and in the auto mode.
In the auto mode a counter is available to count equal, or unequal comparisons.

STATE SECTION

TIMING SECTION

HINT: CLOCK IDENTIFIER

One data bit channel can be used as identifier for the clock.
Apply the clock signal to a free data bit.
With a positive-going clock a '0' bit is shown; with a negative-going clock a '1' bit is shown.
This obtained by the zero-hold time of the clocks.

PARTS LIST PM 3551/10/30/50/70

Code number	Description	Quantity in one instrument
	MECANICAL PARTS	
5322 447 70061	Top cover complete	1
5322 447 70062	Bottom cover complete	1
5322 462 40563	Nylon foot	4
4822 502 30004	Self tap screw for foot	8
5322 480 40142	Dust filter glued in bottom cover	1
5322 417 24024	Quick fastener complete	12
5322 447 70059	Front panel (plast.)	1
5322 459 10582	Textstrip in front panel	1
5322 447 70058	Rear rim (plast.)	1
5322 447 70057	Frame rim front- and rear side (alum.)	2
5322 460 60357	Frame side profile (alum.) ??	2
4822 502 30047	Self tap screw for frame side profile	8
5322 414 60041	Pulling knob (rear side boards)	1 per board
5322 414 20031	Push button 6.5 mm	22
5322 414 20032	Push button 12.5 mm	35
	COMPLETE UNITS	
5322 693 90366	Keyboard 'Functions'	1
5322 693 90367	Keyboard 'Hex pad'	1
5322 693 90368	Keyboard 'Softkeys and cursor'	1
5322 216 91623	LSA 15-1	1
5322 216 91625	LSA 15-2 (1 input closed)	1
5322 216 91626	LSA 15-3	1
5322 216 91617	LTA 50-1	1
5322 216 91618	LTA 50-2	1
5322 216 91621	Power supply (prim.)	1
5322 216 91622	Power supply (sec.)	1
5322 219 80562	Video interface	1
5322 216 91624	Memory extension	1
5322 216 91619	Options board	1
5322 219 80563	Video display unit complete	1

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